THE

AMERICAN GAS-LIGHT JOURNAL.

THE OFFICIAL GAZETTE OF

LIGHT, HEAT, WATER-SUPPLY, AND SEWERAGE.

Rooms—No. 39 Nassau Street, cor. Liberty Street, opposite the Post-Office, New York.

VOL. V.—No. 92. NEW-YORK, THURSDAY, OCTOBER 15, 1863. $3 PER ANNUM.

PETROLEUM-GAS *v.* COAL-GAS.

There are many private and public gas-works in this country where petroleum and its distillates are used from necessity, their consumption not being sufficient to justify continuous operation—necessary for coal-gas—and no other material being deemed available. To such parties the following information, founded on much experience will be valuable.

While it is admitted that petroleum is richer in light-giving material than any other substance known, it is claimed that it cannot be so used advantageously, because its destructive distillation yields so little fixed gas, and causes clogging of the pipes and coating of the retorts; and, now that the oil is not so cheaply obtained, because farther of its increased cost. These objections are final when petroleum is run into the retorts as formerly rosin was used. When thus treated it is vaporized almost instantaneously, and *hence* but a small proportion of the vapor is converted into a fixed gas, and the remainder escapes to be condensed into tar in the pipes. These unfortunate results, when petroleum, and especially its distillates, which are richer still in paraffin, are subjected suddenly to a high heat in rosin or coal-gas retorts, have greatly prejudiced the public against their use, and as so many experiments *in this one direction* have been published, naturally the condemnation which in justice only applies to the treatment adopted, has been extended to the material used. This statement of the case leaves the issue between petroleum and coal as gas-making materials, still unsettled, and confines it to two points. First—Has either material the advantage over the other when the conditions of treatment are the same? There is no doubt that oil distilled in coal-gas retorts cannot compete with coal. If the latter were treated as we shall presently show oil should be treated, it in its turn would be condemned. It follows, therefore, Secondly—That when treated alike neither material is superior to the other; and that as petroleum is many times richer in olefiant-gas and hydrocarbon vapors than coal is, it should be, according to the laws of nature, the better gas-making material of the two.

And now for the proof that it is so, not under all circumstances as yet, but for private works and villages where the consumption is not great. When time and experience have perfected details, it is but a legitimate deduction to add that even the largest works will find petroleum, *and materials of kindred to it*, cheaper than coal, although when such works are once erected they never would change.

The laws governing the destructive distillation of petroleum and its distillates are the opposite of those so successfully applied to the manufacture of coal-gas. They are as follows:—1st. Graduation in the application of the heat, in order to vaporize the oil only as fast as the means provided to convert the vapor formed into gas, can so act upon it. Otherwise there must be great waste of material. 2d. As on the one hand to convert vapor into gas requires its actual contact with red-hot iron, and on the other such contact, if continued, again decomposes the gas, (the cause of the carbonaceous deposit so often found in gas retorts, and which comes from the destruction of gas, not vapor or tar, as many suppose,) the apparatus must be so arranged as to compel the vapor in its passage out of the retort to come into actual contact with its red-hot surface, and while in such contact to travel so rapidly as to leave little or no time for the decomposition of the gas. When treated according to these laws, petroleum will yield to the gallon 125 feet of gas of surpassing richness, and there will be no clogging in the pipes or deposit in the retorts. But to make the manufacture profitable for gas companies, a third condition is required, to wit: Dilution of the gas to secure its combustion without smoke, and enable it to be sold at the prices charged for coal-gas. This condition is fulfilled by distilling the oil in connection with wood. The hydrogen thus obtained, while it dilutes the olefiant gas from the oil, also conserves it while the two gases are passing together over the red-hot surface of the retort. In truth this process requires so little oil, most of the gas being made from the wood, that perhaps the proper classification of petroleum in the manufacture of gas is not as the basis of the process, but merely as the means of enriching hydrogen gas obtained from wood. I limit the material from which the hydrogen is to be obtained to wood, because the objections to the use of water for such a purpose are fatal, and wood alone affords a residuum of equal value with the coke obtained from coal, and which hitherto has been regarded as its great safe-guard against competition.

Having stated the laws according to which petroleum should be treated, it only remains to add the results obtained when it is so treated. There are from each gallon of petroleum, or of petroleum tar, (for experience shows that when treated with wood, the tar, although so much cheaper, answers as well as the oil;) and 155 feet of hard wood, 300 feet of gas of equal illuminating power with coal-gas, and $1\frac{4}{5}$ bushels of good clean charcoal, with the cost of the wood, and therefore leaving the entire yield of gas, so far as cost is concerned, from the tar or oil used. Of course, when so much of the gas comes from the wood, less heat is required than is used for coal, and there cannot possibly be any clogging of the pipes.

The above statement, if proved, certainly sustains what is herein asserted as to the value of petroleum and its distillates as gas-making materials. The writer can only say that it is based on the ordinary operations, not of one, but of many gas-light companies now using petroleum tar and wood as their only materials from which to manufacture their gas. If further proof is required, and any one of the gas companies of New York, or its vicinity, will furnish room on their premises for the purpose, he hereby undertakes that a bench of gas retorts, constructed on the principles above described, shall be built without expense to the company to settle the whole question beyond dispute. H.

DEEP COAL MINE.—The Monkwearmouth coal mine was recently visited by a party of members of the British Association for the advancement of science. This mine is 1,900 feet deep, and the workings of coal underneath extend to a distance of two miles from the shaft. About 300 persons are employed in this mine, and the amount of coal taken out exceeds 600 tons daily. The great depth which has been reached gives abundant evidence of the increasing temperature towards the centre of the earth. The thermometer at the bottom of the shaft stands at from 84° to 90° Fahrenheit.

VIRGINIA CITY, N. T.—The people of the distant Western States and Territories, have shown quite as much enterprise in building gas-works as those of the older and more thickly settled portions of the country. A new gas works is now being built in Virginia City, Nevada Territory, where quite a thriving business is done. The works are being built by the Nevada, California, Gas-Light Company.

PURIFYING GAS BY ANIMAL CHARCOAL.

On the 30th of June last, Mr. Phineas Cowan of England obtained provisional protection for the purification of gas by means of animal charcoal. Mr. George Smedley, of the Sleaford, England, gas-works, who has been using this process for three years, and who claims to have invented it, writes as follows to an English paper:

"Being engaged (with the assistance of another person) in manufacturing manures from the refuse of the works, we made use of animal carbon as a vehicle, and, on one occasion I had some gas-liquor filtered through a small quantity of the same, when I discovered that, after filtration, the liquor was deprived of nearly the whole of its ammonia. I repeated the operation several times, and each time obtained the same result. Then came the thought—I have neither scrubber nor washer; here is a material that has an affinity for ammonia in a liquid form; why not in a gaseous one? Try it. I did so, by filling one tray in each purifier with the carbon. On the following days I applied the turmeric test; and lo! the old nuisance had vanished. I afterward made a small purifier, charged it with carbon, and, on testing the gas with the crude apparatus at my disposal, discovered it had the power of intercepting sulphuretted hydrogen as well as ammonia, but only a small percentage of carbonic acid. Further, I believe gas purified by animal carbon, retains a greater percentage of hydrocarbons than by either lime or oxide of iron. I must confess to you that I have not the means of satisfying myself on these points; and shall only be too glad if any one in the gas world would solve these questions for me. My only idea at present is that it may be useful on small works where no means are provided of getting rid of the ammonia, by using it for that purpose, and afterward disposing of it at a profit. As the great question with us all is to have our gas as pure as possible, at the smallest cost, I submit this to you with the view that some one may take it up."

ILLUMINATING POWER OF LONDON GAS.—The last quarterly report of Dr. Letheby to the city Commission of Sewers of London, presents the following figures:

Illuminating Power in Standard Candles.

	Maximum.	Minimum.	Average.
Great Central Company	16.05	12.14	14.15
Chartered Company	14.65	10.79	13.03
City Company	16.26	8.50	13.78

This is very well for London gas, but American consumers would grumble at such a low standard. In the case of the City Company's gas, when the illuminating power fell to 8.50, it was caused by the unavoidable access of air to the gas while the main was being laid in the neighborhood. The chemical quality of the gas, as regards the proportion of sulphur present, had not been satisfactory, for in a large majority of cases the amount of sulphur was largely in excess of the quantity authorized by Parliament. This is evident from the following amounts of sulphur in grains in 100 feet of gas:

	Maximum.	Minimum.	Average.
Great Central Company	28.2	12.9	18.8
Chartered Company	28.9	16.9	23.1
City Company	30.9	17.7	23.4

We should think the condition of the gas made by these three companies anything but "satisfactory," and the wonder is that they are allowed to distribute gases so laden with impurities. We can only repeat what we have so often stated, that in this country the average illuminating power, and chemical purity of gas, is *far* superior to that made by the London companies.

GAS-LIGHT COMPANIES IN THE UNITED STATES.

Compiled from official sources expressly for the AMERICAN GAS-LIGHT JOURNAL.

CORRECTED BY JOHN B. MURRAY, No. 39 NASSAU STREET, NEW YORK, DEALER IN GAS-LIGHT SHARES.

When Chartered.	Town.	State.	Chartered Capital.	Par Val. Per Sh. $	Semi-Ann'l Div'd.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
1857	ADRIAN	Mich.	50,000	50	—	May & November.	4,000	3 50	....	....	
1856	AKRON	O.	20,000	33⅓	—	Do.	3,500	3 00	....	..	
1845	ALBANY	N. Y.	25 ,000	20	4	January & July.	65,000	3 00	120	....	None in market.
1858	ALBION	N. Y.	30,000	100	—	Do.	3,000	3 80	....	....	
1851	ALEXANDRIA	Va.	106,530	—	—	City Works.	9,000	3 50	....	....	
1852	ALLEGHANY	Pa.	200,000	25	4	May & November.	25,000	3 00	....	....	
1853	ALLENTOWN	Pa.	60,000	100	3½	Do.	5,000	3 50	....	....	
1857	ALTON	Ill.	75,000	—	—	Private Works.	4,000	3 50	....	....	
1859	ALTOONA	Pa.	40,000	20	4	January & July.	5,000	3 00	....	....	
1859	AMESBURY AND SALISBURY	Mass.	30,000	25	—	Do.	7,000	4 00	....	....	
1858	ANNAPOLIS	Md.	100,000	25	—	Do.	4,000	4 00	....	....	
1858	ANN ARBOR	Mich.	23,000	50	5	March & September.	5,500	4 00	....	....	
1858	ASTORIA	N. Y.	20,000	50	—	Do.	6,000	4 00	....	....	
1855	ATLANTA	Ga.	50,000	25	5	January & July.	12,000	5 00	....	....	
1857	ATTLEBORO'	Mass.	6,000	50	3	Do.	2,000	6 00	....	....	
1850	AUBURN	N. Y.	80,000	50	5	Do.	10,000	7 00	....	....	
1851	AUGUSTA	Ga.	80,000	25	8	Do.	9,000	6 00	....	....	
1853	AUGUSTA AND HALLOWELL	Me.	84,700	50	5	Do.	10,000	4 00	....	....	
1860	AURORA	Ind.	10,000	—	—	Private Works.	3,500	3 50	....	....	{ Formerly used Sanders' Water-Gas. Recently altered to Coal Gas-Works.
1817	BALTIMORE	Md.	550,000	100	5	June & December.	150,000	2 50	150	....	None for sale.
1852	BANGOR	Me.	120,000	100	2½	January & July.	12,000	3 00	100	....	
1855	BATAVIA	N. Y.	32,000	20	4	Do.	2,500	4 00	100	100	Stock firm. Good works and well managed.
1853	BATH	Me.	65,000	100	3	April & October.	10,000	3 75	....	....	
1859	BATH	N. Y.	15,000	50	—	May & November.	3,000	7 00	....	....	
1861	BATTLE CREEK	Mich.	15,000	—	—	January & July.			....	....	
1858	BELFAST	Me.	14,000	100	—	Do.	7,000	7 00	....	....	
1856	BELLEFONT	Pa.	20,000	25	2	Do.	3,500	4 00	....	....	
	BELOIT	Wis.	30,000	—	—	Do.	4,000	4 00	....	....	
1854	BETHLEHEM	Pa.	50,000	50	4	June & December.	2,000	3 20	....	....	
1859	BEVERLY	Mass.	40,000	100	—	January & July.	4,000	4 00	....	....	
1853	BINGHAMPTON	N. Y.	50,000	50	3½	Do.	10 000	4 00	....	....	
1859	BIRMINGHAM	Pa.	40,000	50	—	Do.	4,000	4 00	....	....	
1855	BLOOMINGTON	Ill.	40,000	50	—	Do.	6,000	4 00	....	....	
1858	BORDENTOWN	N. J.	50,000	25	3	June & December.	4,000	3 80	....	....	
1822	BOSTON	Mass.	1,000,000	500	5	Do.	130,000	2 25	....	....	
1859	BRATTLEBORO'	Vt.	21,000	—	—	Do.	3,000	4 00	....	....	
1851	BRIDGEPORT	Ct.	90,000	25	4	January & July.	10,000	4 00	90	....	Passed last dividend.
1857	BRIDGETON	N. J.	50,000	20	—	Do.	5,000	4 00	....	....	
1856	BRISTOL	Pa.	30,000	25	3	February & August.	3,000	4 00	....	....	
1855	BRISTOL	R. I.	35,000	50	2	January & July.	6,000	4 00	....	....	
1859	BROCKPORT	N. Y.	25,000	100	3	Do.	1,500	4 00	....	....	
1853	BROOKLINE	Mass.	66,000	100	3½	February & August.	3,500	3 50	....	....	
1825	BROOKLYN	N. Y.	2,000,000	25	5	January & July.	75,000	2 50	170	160	
	BROWNSVILLE	Pa.				Do.			....	....	
1848	BUFFALO	N. Y.	600,000	50	5	Do.	70,000	2 90	140	125	
1852	BURLINGTON	N. J.	100 000	25	3½	Do.	5,000	4 00	105	....	
1853	BURLINGTON	Vt.	75,000	25	2½	Do.	10,000	4 50	....	....	
1859	BURLINGTON	Iowa.	65,000	50	—	Do.	8,000	4 00	....	....	
1861	CALAIS	Me.	90,000	100	—	Do.	10,000	3 50	....	....	
1852	CAMBRIDGE	Mass.	300,000	100	5	February & August.	20,000	3 50	100	97½	
1852	CAMDEN	N. J.	300,000	100	3	April & October.	15,000	3 50	105	100	
1853	CANANDAIGUA	N. Y.	50,000	50	—	January & July.	3,000	4 00	90	80	
1856	CANTON	O.	19,000	50	6	March & September.	6,000	3 00	....	....	
1853	CAPE ISLAND	N. J.	80,000	100	—	October.	10,000	6 00	....	...	{ Watering place —These Works only run in summer.
1860	CARBONDALE	Pa.	16,000	25	—	March & September.	5,000	4 00	....	....	
1855	CARLISLE	Pa.	30,000	25	—	January & July.	4,000	4 00	....	...	
1856	CATASAUQUA	Pa.	15,000	25	5	May & November.	2,000	4 00	....	....	
1858	CATSKILL	N. Y.		—	—	Private Works.	3,000	3 00	....	....	Owned by G. T. Sutton.
1857	CHAMBERSBURG	Pa.	30,000	25	—	January & July.	3,000	4 00	....	....	
1846	CHARLESTON	S. C.	725,800	25	4	Do.	50,000	4 00	....	....	
1851	CHARLESTOWN	Mass.	200,000	50	4	Do.	30,000	3 00	105	.. ..	
1858	CHARLOTTE	N. C.	14,000	50	10	March & September.	3,500	6 00	....	....	
1859	CHARLOTTEVILLE	Vt.	15,000	25	—	Do.	4,000	4 50	....	...	
1851	CHELSEA	Mass.	100,000	100	3½	January & July.	8,000	3 50	....	....	
1856	CHESTER	Pa.	35,000	25	3	April & October.	4,000	4 00	....	....	
1849	CHICAGO	Ill.	1,300,000	25	5	January & July.	100,000	2 50	150	140	Very scarce. Stock wanted.
1857	CHICOPEE	Mass.	50,000	20	—	Do.		4 00	....	....	
1851	CHILLICOTHE	O.	40,000	25	4	Do.	12,000	3 50	....	....	
1841	CINCINNATI	O.	1,600,000	100	5	Do.	225,000	2 50	....	....	
1859	CITIZENS', BROOKLYN	N. Y.	1,000,000	20	—	Do.	135,000	2 00	128	125	
1860	CITIZENS', READING	Mass.	80,000	100	—				....	....	
	CLARKESVILLE	Tenn.	100,000	50	—	Do.	5,000	4 00	....	....	
1860	CLAREMONT	N. H.	20 000	100	—	March & September.	3,000	4 00	....	....	
1846	CLEVELAND	O.	200,000	10	5	January & July.	20,000	3 00	....	....	
1858	CLINTON	Mass.	30,000	500	5	Do.	3,000	4 00	....	....	
1859	CLYDE	N. Y.	10,000	50	4	Do.	2,500	4 00	...	....	
1854	COHOES	N. Y.	50,000	20	3½	April & October.	5,000	3 60	....	....	
1860	COLD SPRING	N. Y.	30,000	50	—	Do.	3,500	4 00	80	....	{ Formerly Rosin-Gas, but now Coal. A well managed company. Stock firmly held.
1860	COLD WATER	Mich.	25,000	50	5	January & July.	4,000	4 00	....	....	
1852	COLUMBIA	Pa.	37,500	25	—	Do.	4,000	3 50	....	....	
1852	COLUMBIA	S. C.	44,000	25	4	Do.	6,000	6 00	....	....	
1857	COLUMBIA	Cal.	50,000	25	—	Do.	4,500	10 00	....	....	
1858	COLUMBUS	Ga.	54,000	25	5	Do.	5,000	7 00	....	....	
1850	COLUMBUS	O.	100,000	10	6	Do.	30,000	3 00	....	....	
1858	CONCORD	N. H.	50,000	50	5	Do.	8,000	3 50	....	....	
1858	COVINGTON AND NEWPORT	Ky.	100,000	50	3½	Do.	28,000	4 00	...	....	
1854	CUMBERLAND	Md.	60,000	50	3	Do.	6,000	4 00	....	....	
1857	DANBURY	Ct.	50,000	25	4	Do.	2,000	3 75	....	...	
1856	DANVILLE	Pa.	30,000	25	—	June & December.	3,000	4 00	....	....	
1855	DAVENPORT	Iowa.	56,000	100	—	Do.	6,000	5 00	....	....	
1848	DAYTON	O.	50,000	25	5	February & August.	8,000	3 50	....	.. ..	
1853	DEDHAM	Mass.	40,000	50	—	January & July.	3,000	4 00	....	....	
1860	DELAWARE	O.	30,000	25	—	Do.	2,500	3 00	....	....	
1849	DETROIT	Mich.	500,000	50	5	Do.	30,000	3 50	160	150	Excellent Stock. No sales.
1860	DOBBS' FERRY	N. Y.	25,000	—	—	Do.	3,000	4 00	....	....	
1854	DORCHESTER	Mass.	150,000	100	—	Do.	14,000	4 00	....	....	
1859	DOVER	Del.	12,000	—	—	Private Works.	2,000	4 00	....	....	
	DOVER	N. H.				January & July.			....	....	
1857	DOYLESTOWN	Pa.	50,000	—	—	Do.	3,000	4 00	....	....	
1854	DUBUQUE	Iowa.	100,000	50	—	Do.	17,000	4 50	....	....	
1853	EAST BOSTON	Mass.	133,000	25	4	Do.	20,000	3 50	....	145	
1858	EAST GREENWICH	R. I.	11,200	100	15	Do.	3,000	7 00	....	...	No transactions.
1861	EAST HAMPTON	Mass.	10,000	25	—	Do.	5,000	9 00	....	....	
1861	EAST NEW YORK	N. Y.	50,000	50	—	Do.	12,000	3 50	....	....	
1857	EASTON	Md.	9,000	10	—	Do.	1,500	7 00	....	....	
1850	EASTON	Pa.	125,000	50	4	June & December.	6,000	3 60	....	....	
1856	EASTPORT	Me.	50,000	55	—	Do.	3,000	4 00	....	....	
1855	ELIZABETH	N. J.	100,000	20	4	January & July.	14,000	3 50	....	....	
	ELLICOTT'S MILLS	Md.	10,000	—	—	Do.	4,000	4 00	....	....	
1852	ELMIRA	N. Y.	50,000	25	3½	Do.	5,000	4 00	....	....	
1852	ERIE	Pa.	68,000	50	3½	June & December.	10 000	3 00	....	....	
1853	EVANSVILLE	Ind.	60,000	50	4	January & July.	12,000	4 00	110	....	
	EXETER	N. H.	60,000	—	—	Do.	12,000		....	....	A very good Company.
	FAIR HAVEN	Ct.	20,000	25		Do.	8,000	4 00	....	....	
1847	FALL RIVER	Mass.	26,000	—	—	Private Works.	12,000	3 50	....	....	
1859	FAYETTEVILLE	N. C.	25,000	100	6	January & July.	7,000	6 00	....	....	
	FIFTH WARD (Milwaukee)	Wis.	50,000	25	—	Do.	10,000	4 00	....	....	
1857	FISHKILL	N. Y.	10,000	20	—	April & October.	1,500	9 00	....	....	
1853	FITCHBURG	Mass.	100,000	50	3	January & July.	5,000	4 00	....	....	Make Petroleum-Gas.
1859	FLEMINGTON	N. J.	20,000	—	—	Do.	3,000	4 00	....	....	
1855	FLUSHING	N. Y.	20,000	50	1½	March & September.	6,500	4 00	...	....	
1858	FOLSOM	Cal.								....	
	FORT WAYNE	Ind.	40,000	25	—	Do.	6,000	4 00	...	...	
1851	FRANKFORT	Ky.	50,000	—	—	City Works.	5,500	4 50	...	....	
1851	FREDERICK CITY	Md.	36,000	100	—	January & July.	5,000	6 70	....	....	
1854	FREDERICKSBURG	Va.	72,500	50	5	Do.	4,500	4 00	....	....	
1858	FREDONIA (Natural Gas)	N. Y.	10,000	100	—	Do.	2,000	4 00	....	....	Unlimited supply of Natural Gas.
1856	FREEPORT	Ill.	20,000	100	—	May & November.	10,000	4 00	....	...	

GAS-LIGHT COMPANIES IN THE UNITED STATES.—Continued.

Compiled from official sources expressly for the AMERICAN GAS-LIGHT JOURNAL.

CORRECTED BY JOHN B. MURRAY, No. 39 NASSAU STREET, NEW YORK, DEALER IN GAS-LIGHT SHARES.

When Chartered.	Town.	State.	Chartered Capital.	Par Val. Per Sh. $	Semi-Ann'l Div'd.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
1859	REMONT	O.	25,000	25	—	May & November.	2,000	4 50	....	....	
1858	F ITON	N. Y.	12,000	100	—	Do.	4,000	7 00	....	....	
1855	GALENA	Ill.	70,000	100	—	Do.	8,000	4 00	....	....	
1859	ALION	O.	25,000	25	—	January & July.	1,800	3 00	....	....	
1858	GALVESTON	Texas.	150,000	50	—	May & November.	7,000	6 00	....	....	
1854	GARDINER	Me.	100,000	50	4	Do.	8,000	4 00	....	....	
1853	GENEVA	N. Y.	75,000	25	2½	Do.	6,000	4 00	....	....	
1851	GERMANTOWN	Pa.	Merged	into	the	Philadelphia Works.	12,000	2 25	....	....	
1859	GETTYSBURG	Pa.	20,000	50	3	January & July.	2,500	4 00	....	....	
1854	GLENN'S FALLS	N. Y.	35,000	50	3	February & August.	4,000	4 00	....	....	
1854	GLOUCESTER	Mass.	40,000	50	—	January & July.	5,000	3 50	....	....	
1857	GLOVERSVILLE	N. Y.	15,000	25	—	Do.	3,000	3 50	....	....	
1858	GRAND RAPIDS	Mich.	50,000	20	—	Do.	3,000	4 00	....	....	
1855	GREAT BARRINGTON	Mass.	5,000	100	5	April & October.	2,000	7 00	....	....	
1849	GREAT FALLS	N. H.	50,000	100	3	Do.	3,000	4 00	...	....	
1860	GREENFIELD	Mass.	20,000	50	2	January & July.	2,500	4 00	....	....	Close corporation.
1853	GREENPOINT	N. Y.	100,000	50	5	Do.	20,000	3 00	....	....	
1859	GREENSBORO'	N. C.	12,000	50	—	April & October.	3,000	7 00	....	....	
1858	GREENSBURG	Pa.	30,000	25	3	May & November.	2,000	3 00	....	....	
1854	HAGERSTOWN	Md.	15,000	20	—	January & July.	2,000	6 00	....	....	
	HAMILTON	O.	15,000			Do.			....	....	
1859	HANNIBAL	Mo.	100,000	100	—	Do.	6,000	3 50	....	....	
1857	HARLEM	N. Y.	350,000	50	3½	Do.	25,000	3 00	....	145	
1855	HARRISBURG	Pa.	100,000	—	4	Do.	5,000	4 00	...	....	
1849	HARTFORD	Ct.	200,000	25	4	Do.	25,000	3 00	150	140	Stock in demand.
	HASTINGS	N. Y.				Do.	8,000	4 00	...	....	
1858	HAVERHILL	Mass.	50,000	50	—	Do.	5,000	4 00	....	....	
1859	HAVERSTRAW	N. Y.	20,000	100	—	Do.	5,000	4 00	....	....	
1861	HAVERSVILLE	Mass.	15,000	25		Do.	4,000	4 00	....	....	
1859	HEMPSTEAD	N. Y.	16,000	25	—	Do.	1,000	4 00	....	....	
1862	HOBOKEN	N. J.	100,000	25	3	Do.	30,000	2 50	....	100	Works not yet built.
1856	HOLLIDAYSBURG	Pa.	30,000	25	2	Do.	4,000	3 50	....	....	
1861	HOLYOKE	Mass.	20,000	25	—	Do.	3,000	4 00	....	....	
1861	HOMER & CORTLANDT	N. Y.	40,000	100	—	Do.	6,000	4 00	....	....	
1854	HONESDALE	Pa.	30,000	25	3	Do.	2,500	4 00	...	....	
1860	HORNELLSVILLE	N. Y.	12,000	50	—	Do.	2,000	4 00	....	....	
1858	HUDSON	N. Y.	50,000	100	3½	February & August.	3,000	4 00	....	....	
	HUNTER'S POINT	N. Y.									
1857	HUNTINGTON	Pa.	18,000	50	3	Do.	2,000	3 50	....	....	
1856	HUNTSVILLE	Ala.	7,325	25	—	June & December.	2,000	5 00	....	....	
	INDIANAPOLIS	Ind.	150,000	—	—	Do.	15,000	5 00	....	....	
1857	IOWA CITY	Iowa.	40,000	50	—	February & August.	4,000	4 50	....	....	
1852	ITHACA	N. Y.	75,000	25	3½	January & July.	6,000	4 00	....	....	
1857	JACKSON	Mich.	25,000	50	5	Do.	6,000	3 50	....	....	
	JACKSON	Miss.	80,000	50	—	Do.	4,000	4 50	....	....	
	JACKSON	Cal.	50,000	30	—	Do.	4,000	10 00	....	....	
	JACKSONVILLE	Flor.	30,000	20	—	Do.	2,000	7 00	....	....	
	JACKSONVILLE	Ind.	50,000	50	—	Do.	4,000	5 00	....	....	
1858	JACKSONVILLE	Mo.	25,000	25	—	Do.	7,000	6 00	....	....	
1856	JAMAICA	N. Y.	20,000	—	4	Do.	6,000	4 00	....	....	
1853	JAMAICA PLAIN	Mass.	75,000	100	3½	Do.	3,000	3 50	....	....	
	JAMESTOWN	N. Y.	25,000	—	—	Do.	4,000	4 00	....	....	
1856	JANESVILLE	Wis.	50,000	100	—	Do.	12,000	4 00	....	....	
	JEFFERSONVILLE	Md.	30,000	25		Do.	4,000	4 00	....	....	
1853	JERSEY CITY	N. J.	300,000	—	5	Do.	30,000	3 00	150	....	No sales since formation of Hoboken Co.
1858	JERSEY SHORE	Pa.	15,000	25	—	Do.	2,000	3 70	....	....	
1856	JOHNSTOWN	Pa.	80,000	25	3	Do.	8,000	3 00	....	....	
1857	JOLIET	Ill.	300,000	100	—	June & December.	6,000	4 00	....	....	
1858	KALAMAZOO	Mich.	30,000	50	5	Do.	10,000	4 00	....	....	
1860	KEENE	N. H.	60,000	100	—	Do.	4,500	4 00	....	....	
1855	KEOKUK	Iowa.	100,000	100	—	January & July.	10,000	4 50	....	....	
1855	KINGSTON	Pa.	50,000	50	—	Do.	3,000	4 00	....	....	
1859	KITTANNING	Pa.	20,000	—	—	Doubtful.	5,000	4 00	....	....	Said to be a fraud.
1854	KNOXVILLE	Tenn.	63,000	—	—	April & October.	4,000	5 00	....	....	
1860	LACONIA	N. H.	20,000	100	—	Do.	4,000	6 00	....	....	
1859	LA CROSSE CITY	Wis.	100,000	50	—	June & December.	10,000	5 00	....	....	
1854	LAFAYETTE	Ind.	60,000	50	4	January & July.	10,000	3 25	....	....	
1856	LAMBERTVILLE	N. J.	30,000	25	—	Do.	2,600	4 00	....	....	
1849	LANCASTER	Pa.	100,000	50	4	Do.	10,000	3 00	....	....	
1856	LANCASTER	O.	25,000	100	5	Do.	5,000	3 50	....	....	
1855	LANSINBURG	N. Y.	25,000	100	—	Private Works.	7,000	4 00	....	....	
1849	LAWRENCE	Mass.	200,000	100	4	February & August.	15,000	3 50	....	....	
1859	LEAVENWORTH	Kansas.	200,000	25	—	January & July.	10,000	5 00	....	....	
1856	LEBANON	Pa.	26,000	50	—	February & August.	5,000	4 00	....	....	
1861	LE ROY	N. Y.	25,000	50	—	Do.	4,000	4 00	....	....	
1858	LEWISBURG	Pa.	20,000	100	—	January & July.	4,000	4 00	....	...	
1852	LEWISTON	Me.	100,000	100	3	Do.	10,000	3 20	....	....	
1856	LEWISTOWN	Pa,	30,000	50	3	April & October.	3,000	3 10	....	....	
1853	LEXINGTON	Ky.	100,000	25	4	January & July.	5,000	4 00	....	....	
1853	LITTLE FALLS	N. Y.	112,000	25	—	Do.	3,500	7 00	....	....	
1861	LITTLE ROCK	Ark.	20,000	—	—	Do.	5,000	6 00	....	....	
1858	LOCKHAVEN	Pa.	28,000	—	—	Do.	3,000	4 00	....	....	
	LOCKPORT	N. Y.	100,000	50	—	Do.	4,000	4 00	....	....	
1838	LOUISVILLE	Ky.	600,000	50	6	Do.	80,000	2 50	125	....	But $481,400 stock has been sold. This Company has a large contingent fund and undivided profit on hand.
1849	LOWELL	Mass.	200,000	25	5	Do.	50,000	3 25	....	....	
1852	LYNCHBURG	Va.	70,000	25	5	Do.	6,000	3 80	....	....	
1852	LYNN	Mass.	55,000	50	4	Do.	20,000	4 00	....	....	
1859	LYONS	N. Y.	30,000	100	—	Do.	4,000	4 00	....	....	
1852	MACON	Ga.	75,160	25	6	Do.	5,000	5 00	....	....	
1851	MADISON	Ind.	160,000	25	3	Do.	10,100	3 50	....	....	
1855	MADISON	Wis.	100,000	25	—	Do.	5,000	5 00	....	....	
1854	MALDEN & MELROSE	Mass.	50,000	25	3	February & August.	5,000	4 00	....	....	
1852	MANAYUNK	Pa.	40,000	100	—	Do.	7,000	4 00	....	....	
1852	MANCHESTER	N. H.	100,000	100	5	January & July.	25,600	3 00	....	....	
1830	MANHATTAN (N. Y. City)	N. Y.	4,000,000	50	5	Do.	600,000	2 50	300	375	
	MANSFIELD	O.	25,000	—	—	Do.	10,000	4 00	....	....	
1854	MARBLEHEAD	Mass.	40,000	100	3	Do.	1,000	4 00	....	....	
	MARLBORO'	Mass.	20,000	—	—	Do.	8,000	4 00	....	....	
	MAUCH CHUNK	Pa.	50,000	50	—	Do.	7,000	4 00	....	....	
1857	MARIETTA	O.	50,000	50	—	Do.	7,000	4 00	....	....	
1860	MARION	O.	12,000	25	5	April & October.	1,500	3 55	....	....	Stock firm.
1858	MARYSVILLE	Cal.	50,000	100	—	January & July.	4,000	12 50	....	....	
1857	MASSILON	O.	20,000	25	—	Do.	5,000	3 00	....	....	
1855	MEADVILLE	Pa.	39,500	25	—	Do.	4,000	3 50	....	....	
	MEDINA	N. Y.	2,000	100	—	Do.	2,000	7 00	....	....	
1852	MEMPHIS	Tenn.	300,000	100	5	June & December.	12,000	3 50	....	....	
	MERIDEN	Ct.	20,000			Do.			....	....	
1859	METROPOLITAN (N. Y. City)	N. Y.	1,000,000	100	—	January & July.	200,000	2 50	....	....	
1859	MIDDLEBORO'	Mass.	15,000	—	—	Private Works.		6 00	....	....	
1858	MIDDLETOWN	Ct.	50,000	25	3	March & September.	5,000	3 80	....	....	
	MIDDLETOWN	N. Y.		25	—	Private Works.	3,000	3 00	....	....	Owned by G. T. Sutton.
	MILFORD	Mass.	20,000	—	—	Do.		4 00	....	....	
	MILLEDGEVILLE	Ga.	100,000	50	—	Do.		5 00	....	....	
	MILTON	Pa.	10,000			Do.			....	....	
1847	MILWAUKEE	Wis.	400,000	50	5	January & July.	24,000	3 50	150	....	
1852	MOBILE	Ala.	200,000	—	—	Do.	30,000	4 50	....	....	
1836	MONROE	Mich.	40,000	50	—	Do.	5,000	3 50	50	....	
1852	MONTGOMERY	Ala.	100,000	25	4	February & August.	7,000	6 00	....	....	
1856	MONTPELIER	Vt.	30,000	25	3	January & July.	5,000	4 50	....	....	
1859	MORRISANIA	N. Y.	30,000	50	—	Do.		4 00	....	....	
1839	MORRISTOWN	N. J.	18,000	50	—	Do.	3,500	4 00	....	....	
1854	MOUNT HOLLY	N. J.	16,650	25	3	April & October.	2,000	7 00	....	....	
	MOUNT VERNON	O.	50,000	100	—	Do.		4 00	....	....	
1857	MUSCATINE	Iowa.	50,000	100	—	January & July.	3,000	4 50	....	....	
1854	NANTUCKET	Mass.	50,000	100	3	February & August.	6,000	4 00	....	....	

GAS-LIGHT COMPANIES IN THE UNITED STATES.—Continued.

Compiled from official sources expressly for the AMERICAN GAS-LIGHT JOURNAL.

CORRECTED BY JOHN B. MURRAY, No. 39 NASSAU STREET, NEW YORK, DEALER IN GAS-LIGHT SHARES.

When Chartered.	Town.	State.	Chartered Capital.	Par Val. per Sh. $	Semi-Ann'l Div.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
1852	Nashua	N. H.	45,000	50	3½	January & July.	10,000	3 50	....	....	
1850	Nashville	Tenn.	200,000	50	5	Do.	25,000	3 50	....	...	
1858	Natchez	Miss.	46,000	50	—	Do.	20,000	5 00	....	...	
	Nevada City	Cal.							....	....	
1852	New Albany	Ind.	200,000	50	3½	Do.	16,000	3 50	....	...	
1846	Newark	N. J.	362,000	50	5	Do.	45,000	3 62	130	...	Always a favorite stock.
1856	Newark	O.	30,000	100	—	Do.	7,000	5 40	....	...	
1852	New Bedford	Mass.	130 000	100	5	Do.	15,000	2 90	102	....	Well managed and kept quiet.
1859	Newbern	N. C.	22,000	100	6	Do.	6,000	3 50	....	....	
	New Britain	Ct.	30,000	20	5	Do.	3,000	4 00	....	....	
1851	New Brunswick	N. J.	100,000	20	4	Do.	8,000	2 00	115	....	
1852	Newburg	N. Y.	67,000	20	4	Do.	10,000	4 00	105	....	
1852	Newburyport	Mass.	150,000	10	4	Do.	9,000	4 00	92½	....	
1857	Newcastle	Del.	32,300	10	3	Do.	4,000	4 00	90	....	
1847	New Haven	Ct.	250,000	25	4	Do.	30,000	3 00	155	....	None in market.
1858	New London	Ct.	70,000	50	3	Do.	12,000	4 00	105	....	Do.
1835	New Orleans	La.	1,500,000	100	6	Do.	120,000	4 00	180	....	
1858	Newport	R. I.	130,200	100	4	Do.	10,000	3 50	112	....	
1854	Newton & Watertown	Mass.	300,000	100	2	Do.	10,000	4 00	....	....	
	Newton	N. J.	30,000	—	—	Do.	3,000	4 00	....	....	
	Newton	Pa.	20,000	50	—	Do.	2,500	4 00	....	....	
1828	Newtown	N. Y.									
1859	New York	N. Y.	1,000,000	50	5	May & November.	100,000	2 50	300	....	
	Niagara Falls	N. Y.	15,000	25	—	Do.	3,000	4 00	90	....	
	Norfolk	Va.	60,000	25	—	Do.	40,000	4 00	....	....	
1858	Norristown	Pa.	41 700	25	4	June & December.	8,000	3 50	....	....	
1855	North Attleboro'	Mass.	50,000	100	3½	Do.	6,000	4 00	....	....	
	Northern Liberties	Pa.	400,000	25	7	City Works.	40,000	2 50	....	....	
	North Adams	Mass.	25,000	—	—	March & September.	30,000	4 00	....	...	
1856	Northampton	Mass.	85,000	25	3	January & July.	4 500	4 00	....	....	
1859	North Bridgewater	Mass.	16,000	100	4	June & December.	1,000	7 00	....	....	
1856	Norwalk	Ct.	30,000	150	4	February & August.	6,000	4 00	....	....	
1859	Norwalk	O.	30,000	25	—	January & July.	4,000	4 00	....	....	
1854	Norwich	Ct.	75,000	25	3½	Do.	12,000	3 50	....	....	
1861	Norwich	N. Y.	12,000	50	—	Do.	2,500	4 00	....	...	
1859	Nyack	N. Y.	20,000	100	—	Do.	2,500	4 00	....	....	
1860	Oberlin	O.	10,000	—	—	Do.	1,200	4 00	....	...	
1855	Ogdensburg	N. Y.	75,000	50	5	Do.	9,000	4 00	....	....	
1859	Orange	N. J.	65,000	25	—	Do.	6,000	3 50	....	....	
1852	Oswego	N. Y.	81,250	100	3½	Do.	15,000	4 00	105	....	Good works, built by Hoy, Jr., & Kennedy.
1855	Ottawa	Ill.	45,000	100	6½	Do.	6,000	4 00	....	....	
1856	Owego	N. Y.	40,000	50	3½	Do.	5,000	4 00	....	....	
1860	Owensboro'	Ky.	25,000	25	—	Do.	4,000	3 50	....	....	
1856	Paducah	Ky.	75,000	100	—	May & November.	4,000	5 00	....	....	
1861	Painsville	O.	40,000	25	5	Do.	2,500	5 00	....	....	
1856	Palmyra	N. Y.	12,000	25	—	January & July.	3,000	7 00	....	....	
1847	Paterson	N. J.	125,000	25	3	Do.	20,000	3 50	95	....	
1830	Pawtucket	R. I.	75,000	50	4	Do.	12 000	3 00	....	....	Surplus $10,000, May 15, 1863.
1855	Peekskill	N. Y.	31,000	50	3	June & December.	4,000	4 00	....	....	Works leased to Gilbert T. Sutton.
1860	Penn Yan	N. Y.	12,000	50	5	Do.	3,000	4 00	....	....	
1859	Peoples', Chicago	Ill.	500,000	50	New	Do.	100,000	2 50	....	....	What is this Company doing?
1855	Peoria	Ill.	160,000	50	4	Do.	8,000	3 50	....	....	
1852	Petersburg	Va.	120,000	—	5	January & July.	20,000	3 80	....	....	
1841	Philadelphia	Pa.	3,000,000	50	—	City Works.	650 000	2 00	....	....	
1855	Piqua	O.	50,000	50	—	January & July.	6,500	4 00	....	....	
1835	Pittsburg	Pa.	300,000	100	5	Do.	60,000	1 50	115	....	
1854	Pittsfield	Mass.	50,000	100	5	Do.	4,500	4 00	....	....	
1858	Placerville	Cal.	30,000	50	—	Do.	4,500	10 00	....	....	
1860	Plainfield	N. J.	25,000	50	—	Do.	2,500	4 00	....	....	
1859	Plattsburg	N. Y.	16,000	50	—	January & July.	5,000	7 00	....	....	
1853	Plymouth	Mass.	40,000	100	—	April & October.	8,000	4 00	....	....	
1860	Port Chester	N. Y.	50,000	50	—	Do.	4,000	4 00	....	....	
1860	Port Jervis	N. Y.	20,000	100	—	Do.	3,000	4 10	....	...	
1849	Portland	Me.	300,000	50	4	January & July.	30,000	3 00	....	....	
1859	Portland	Oreg.	50,000	50	—	Do.	3,500	8 00	....	....	
1859	Port Lavacca	Texas.	50,000	100	—	Do.	2,500	7 00	....	....	
1851	Portsmouth	N. H.	70,000	100	8	April & October.	6,500	3 70	....	....	
1855	Portsmouth	O.	50,000	50	4	January & July.	10,000	3 50	....	....	
1855	Portsmouth	Va.	100,000	50	4	Do.	4,000	4 00	....	....	
1856	Pottstown	Pa.	20,000	50	3	Do.	3,500	4 00	....	....	
1850	Pottsville	Pa.	110,000	50	2	Do.	10,000	3 50	....	....	
1850	Poughkeepsie	N. Y.	84,000	25	4	March & September.	15,000	3 50	120	110	
1848	Providence	R. I.	1,000,000	50	4	January & July.	60,000	3 00	122	....	
1853	Quincy	Ill.	300,000	50	4	June & December.	12.000	3 50	....	....	
	Quincy	Mass.	00,000	00	—	Do.	00,0 0	0 00	....	....	
1855	Racine	Wis.	43,500	26	—	Do.	7,000	3 50	....	....	
1857	Rahway	N. J.	50,000	20	—	January & July.	5,000	4 00	....	....	
1858	Raleigh	N. C.	25,000	100	6	May & Novrmber.	5,000	6 00	....	....	
1848	Reading	Pa.	100,000	25	4	January & July.	25,000	3 00	....	....	
1851	Richmond	Va.	341.975	—	—	City Works.	30,000	3 00	....	....	Jeff. Davis has extinguished the gas-lights of Richmond, Va.
1859	Richmond	Mass.	40,000	25	—	January & July.	3,000	4 00	....	....	
	Richmond County	N. Y.									
1859	Ripley	O.	30,000	50	—	Do.	2,000	4 50	....	....	
1852	Rochester	N. Y.	200,000	50	5	Do.	50,000	2 50	....	....	
1857	Rockford	Ill.	40,000	50	—	Do.	4,000	4 00	....	....	
1854	Rock Island	Ill.	100,000	50	—	Do.	6,000	4 50	....	....	
1854	Rockland	Me.	50,000	100	—	Do.	6,000	4 40	....	...	
1852	Rome	N. Y.	85,000	100	3½	Do.	10,000	3 60	....	....	
1854	Roxbout and Kingston	N. Y.	65,150	20	3½	June & December.	10,000	3 80	....	....	
1854	Roxbury	Mass.	150,000	100	5	January & July.	20,000	3 50	....	....	
1859	Rutland	Vt.	20,000	25	—	Do.	4,000	3 50	....	....	
	Saco	Me.	71,600	100	3½	April & October.	8,000	4 00	....	....	
1857	Sacramento	Cal.	500,000	100	—	Do.	40,000	10 00	....	....	
1859	Sag Harbor	N. Y.	20,000	—	—	Do.	4,000	4 00	....	....	
1858	Saint Albans	Vt.	15,000	20	—	Do.	3,000	7 00	....	....	
	Saint Johnsbury	Vt.	30,000	25	—	Do.	4,000	4 00	....	....	
1857	Saint Joseph	Mo.	50,000	100	5	January & July.	6,000	5 00	....	....	
1839	Saint Louis	Mo.	600 000	50	—	June & December.	180,000	3 50	....	....	
1857	Saint Paul	Min.	200,000	50	3	January & July.	10,000	6 00	....	....	Surplus $10,000, May 15, 1863.
1856	Salem	N. J.	30,000	25	3	Do.	5,000	3 86	....	....	
1850	Salem	Mass.	200,000	100	4	February & August.	30,000	3 24	..	....	
1859	Salem	O.	25,000	20	—	Do.	3,000	3 00	....	....	
1859	Salisbury	N. C.	14,600	50	6	May & November.	3.500	6 00	....	...	
	Salisbury Mills	Mass.	1,250	25	—	Do.	3,000	4 00	....	....	
	Salmon Falls	Me.	25,000	100	—	Do.	3,000	4 00	....	....	
	San Antonio	Texas.	75,000	20	—	Do.	40,000	6 00	....	....	
1854	Sandusky	O.	75,000	50	—	April & October.	9,000	3 00	....	....	
1859	Sandwich	Mass.	10,000	—	—	Private Works.	2,000	3 50	....	....	
1852	San Francisco	Cal.	2,000,000	100	4½	Do.	100,000	6 50	100	....	
	San Jose	Cal.							....	....	
1853	Saratoga Springs	N. Y.	39,000	100	—	January & July.	6,000	3 60	70	....	
	Saugerties	N. Y.	30,000	20	—	Do.	4,000	3 00	....	....	
1849	Savannah	Ga.	200,000	25	5	Do.	10,000	3 75	....	....	
1851	Schenectady	N. Y.	50,000	—	—	Private Works.	11,000	4 00	....	....	
1858	Scranton, Gas and Water	Pa.	100,000	25	—	January & July.	6,000	3 80	....	....	About trying Water-Gas.
1857	Selma	Ala.	20,000	100	—	Do.	2,000	5 00	....	....	
1856	Seneca Falls and Waterloo	N. Y.	80,000	50	3	Do.	10,000	4 00	100	....	
	Shreveport	La.	40,000	25	—	Do.	3,000	0 50	....	....	
1856	Sing Sing	N. Y.	40,000	100	—	Do.	3,000	3 50	....	....	
	Smyrna	Del.						4 00	....	....	Petroleum Gas.
1860	South Adams	Mass.	10,000	25	—	Do.	3,000	4 00	....	....	
1859	South Bridge	Mass.	5,000	25	—	Do.	4,010	6 00	....	....	
	South Boston	Mass.	200,000	50	—	Do.	60,000	3 25	110	....	
	Springfield	O.	200,000	100	—	Do	20,000	3 50	....	....	
1854	Springfield	Ill.	75,000	50	—	January & July.	10,000	3 50	....	....	
1848	Springfield	Mass.	100,000	500	5	February & August.	10,000	3 60	140	....	
1855	Stamford	Ct.	6,250	25	5	April & October.	3,000	3 50	....	....	
1857	Staten Island	N. Y.	150,000	50	5	January & July.	26,000	4 00	95	....	

GAS-LIGHT COMPANIES IN THE UNITED STATES.—Continued.

Compiled from official sources expressly for the AMERICAN GAS-LIGHT JOURNAL.

CORRECTED BY JOHN B. MURRAY, No. 39 NASSAU STREET, NEW YORK, DEALER IN GAS-LIGHT SHARES.

When Chartered.	Town.	State.	Chartered Capital.	Par Val. per Sh. $	Semi-Ann'l Div'd.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
1859	Staunton	Va.	18,000	50	6	January & July.	4,000	7 00	....	....	
	Steubenville	O.	150,000	100	—	Do.	15,000	4 00	....	....	
	Stockton	Cal.	50,000	—	—	Do.	8,000	10 00			
1848	Syracuse	N. Y.	125,000	25	5	March & September.	25,000	3 00	112	....	
	Tamaqua	Pa.	40,000	25	—	Do.	3 000	4 00	....	....	
1859	Tarrytown and Irvington	N. Y.	70,000	50	—	January & July.	3,000	4 00	....	....	
1853	Taunton	Mass.	100,000	50	4	Do.	10,000	4 00	....	....	
	Terre Haute	Ind.	100,000	100	—	Do.	3,000	4 00	....	....	
	Thompsonville	Ct.	25,000	50	—	Do.	4,000	4 50	....	....	
	Tiffin	O.	25,000	20	—	Do.	4,000	4 00	....	....	
1853	Toledo	O.	100,000	50	3	Do.	8,000	3 50	....	....	
1847	Trenton	N. J.	100,000	20	4	Do.	15,000	3 42	....	110	
1848	Troy	N. Y.	200,000	100	4	June & December.	35,000	3 00	160	....	
1856	Urbana	O.	30,000	25	—	April & October.	3,500	4 00	....	....	
1849	Utica	N. Y.	80,000	100	4	Do.	22,000	3 60	....	....	
1853	Vicksburg	Miss.	66,000	50	—	March & September.	4,000	4 50	....	....	
1859	Vincennes	Ind.	25,000	100	—	January & July.	2,000	4 00	....	....	
1863	Virginia City.	N. T.					20,000				
1858	Walden	N. Y.	2,500	—	—	Private Works.	1,000	6 00	....	....	
1853	Waltham	Mass.	100,000	100	4	January & July.	3,000	4 00	....	....	
1857	Ware	Mass.	30,000	20	—	Do.	3,500	4 00	....	....	
1861	Warren	O.	30,000	50	—	Do.	4,000	3 00	....	....	
1854	Warren	R. I.	20,000	25	—	Do.	3,000	4 00	....	....	
1855	Washington	D. C.	500,000	20	5	Do.	50,000	2 61	150	148	
1859	Washington	N. C.	15,000	100	—	April & October.	1,500	6 00	....	....	
1848	Washington	Pa.	20,000	25	4	January & July.	4,000	3 00	....	....	
1854	Waterbury	Ct.	100,000	25	—	Do.	4,000	4 00	....	....	
1852	Waterford	N. Y.	12,000	25	—	Do.	4,000	4 00	....	....	
1852	Watertown	N. Y.	20,000	100	—	Do.	10,000	7 00	....	....	
1856	Watertown	Wis.	25,000	100	—	Do.	5,000	5 00	....	....	
1858	Wautoma	Wis.	30,000	50	—	Do.	3,000	4 50	....	....	
1857	Waverly	Miss.	20,000	100	—	April & October.	4,000	5 00	....	....	
1854	West Cambridge	Mass.	60,000	100	—	February & August.	10.000	4 00	....	....	
1852	Westchester	Pa.	100,000	25	2½	Do.	3,500	3 50	....	....	
	Westfield	Mass.	25.000	100	6	Do.	4,000	4 00	....	....	
	Weston	O.	20,000	25	—	Do.		5 00	....	....	
1857	West Point	N. Y.	50,000	—	—	United States Military	Academy.	2 00	....	....	
1853	West Troy	N. Y.	100,000	50	3	January & July.	10,000	3 60	85	....	
1850	Wheeling	Va.	75,000	25	6	Do.	12,000	2 70	....	....	
	White Plains	N. Y.	20,000	20	—	Do.			....	....	
1856	Wilkesbarre	Pa.	50,000	50	—	May & November.	4,000	3 33	100	80	
1850	Williamsburg	N. Y.	1,000,000	50	5	January & July.	60,000	3 00	....	....	
1858	Williamsburg	Va.	30,000	25	—	Do.	3,000	4 00	....	....	Camp-fires of the Union Army light up this place at present.
1857	Williamsport	Pa.	70,000	25	4	Do.	3,500	3 80	....	....	
1859	Willimantic	Ct.	12,000	—	—	Do.	2,500	3 50	....	....	
1853	Wilmington	N. C.	60,000	50	5	Do.	8,000	5 00	....	....	
1852	Wilmington	Del.	200,000	50	5	February & August.	20.000	3 00	....	....	
1854	Winchester	Va.	36,000	50	6	January & July.	5,000	4 00	....	....	
	Windsor.	Vt.									
	Woburn	Mass.	20,000	—	—	Do.	3,000	4 00	....	....	
1856	Woodstock	Vt.	10,000	50	4	Do.	4,000	6 00	....	....	
1853	Woonsocket	R. I.	82,600	100	4	April & October.	4,000	3 50	....	....	
1856	Wooster	O.	25,000	50	—	January & July.	6.000	3 00	....	....	
1849	Worcester	Mass.	160,000	100	5	Do.	15,000	3 50	....	....	
1855	Xenia	O.	40,000	50	—	Do.	3,000	4 00	....	....	
1854	Yonkers	N. Y.	75,000	50	2½	Do.	6,500	4 00	102½	....	
1849	York	Pa.	40,000	57	3	June & December.	10,000	3 50	....	....	
	Yorkville	S. C.	20,000	25	—	Do.	4,000	4 00	....	....	
1858	Ypsilanti	Mich.	20,000	50	5	February & August	6,000	14 00	....	....	
1850	Yreka	Cal.	30,000	100	—	Do.	2,000	0 00	....	....	
1848	Zanesville	O.	44,600	25	4	Do.	10,000	3 00	....	....	

GAS-LIGHT COMPANIES IN THE BRITISH PROVINCES OF NORTH AMERICA.

When Chartered.	Town.	Province	Chartered Capital.	Par Val. per Sh. $	Semi-An'l Div'd.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
1854	Belleville	C. W.	33,040	100	4	January & July.	1,200	5 00	....	....	
1854	Brantford	C. W.	32,000	100	2½	Do.			....	....	
	Brockville	C. W.	50,000	—	—	Do.	5,000	4 00	....	....	
	Chatham	N. B.	50,000	—	—				....	....	
1854	Charlotte Town	P. E. I.	50,000	100	5	Do.	3,000	3 50	....	....	
1857	Cobourg	C. W.	30,000	—		February & August.	4,000		....	....	
	Dundas	C. W.	30,000	—	—	Do.	6,000	4 00	....	....	
	Frederick	N. B.	50,000	—	—	Do.			....	....	
1843	Halifax	N. S.	160,000	40	7	May.	30,000	3 00	....	....	
1850	Hamilton	C. W.	125,000	40	5	March & September.	20,000	3 50	....	....	
1848	Kingston	C. W.	80,000	100	—	Do.	6,000	3 50	....	....	
1853	London	C. W.	100,000	20	5	May & November.	5,000	5 00	....	....	
1847	Montreal	C. E.	400,000	40	—	March & September.	110,000	2 80	....	113	Last sale at this figure.
1854	Ottawa	C. W.	40.000	40	5	Do.	5,000	4 50	....	....	
1859	Point Levi	C. E.	25,000	25	—	January & July.	4,000	3 50	....	....	
1859	Port Hope	C. W.	28,000	20	4	May & November.	4,500	3 50	....	....	
1847	Quebec	C. E.	200,000	200	4	January & July.	60,000	3 00	....	....	
1848	Saint Catherine's	C. W.	80,000	20	—	May & November.	7,000	4 50	....	....	
1859	Saint Hyacinthe	C. E.	15,000	20	—	Do.	4,000	4 00	....	....	
	Saint John	N. B.	170,000	85	4	June & December.	25,000	3 00	110	110	Sales at this figure.
	Saint John's	N. F.	50,000	—	4	Do.	30,000		....	....	
1858	Sorel	C. E.	14,000	20	4	Do.	4,000	3 00	....	....	
1848	Toronto	C. W.	400,000	50	—		50,000	3 33½	....	....	This Co. pay a quarterly div. of 2 per ct.

GAS-LIGHT COMPANIES IN CUBA, MEXICO, SOUTH AMERICA AND NEW ZEALAND.

When Chartered.	Town.	State.	Chartered Capital.	Par Val. per Sh. $	Semi-An'l Div'd.	Dividends Payable.	Population of Gas District.	Price per 1000 Feet.	Asked pr. cent.	Offered pr. cent.	REMARKS.
	Callao	Chile.		—	—	January & July.	20,000	7 00	....	....	
	Cardenas	Cuba.	50,000	—	—	Do.	180,000	5 00	....	....	
1857	Compania Cubana	Hav'a.	500,000	500	10	Do.			....	....	
	Cienfugos	Cuba.		—	—	Do.	12,000	5 00	....	....	These four towns are lighted by the Compania Cubana o Havana.
	Guanabacoa	Cuba.		—	—	Do.	14,000	5 50	....	....	
	Regla	Cuba.		—	—	Do.	10,000	5 00	....	....	
	Trinidad	Cuba.		—	—	Do.	16.000	5 00	....	....	
	Guyaquil	S. A.	150,000	—	—	Do.	35,000		....	....	
	Havana	Cuba.	1,250,000	500	7½	Do.	300,000	5 00	....	....	
	Lima	Peru.	100,000	—	—	Do.	150,000		....	....	
	Maranham (Chartered)			—	—	Do.			....	....	
	Matanzas	Cuba.	50,000	—	—	Do.	180,000	8 50	....	....	
	Mexico City	Mex.	550,000	—	—	Do.			....	....	
	Montevideo	S. A.	500,000	—	—	Do.			....	....	
	Para (Chartered)			—	—	Do.			....	....	
18 4	Rio de Janeiro	S. A.	1,000,000	500	7½	Do.	300,000	4 00	....	....	
	San Iago	Chile.	500,000	—	—	Do.	180,000	7 00	....	....	
1857	Saint Jago de Cuba	Cuba.	450.000	500	—	Do.	25,000	5 00	....	....	
	Valparaiso	Chile.	500,000	—	—	Do.	85,000	6 00	....	....	
	Vera Cruz	Mex	500,000	—	—	Do.			....	....	
	Vi le Clara	Cuba.	50,000	—	—	Do.			....	....	
	Auckland	N. Z.		—	—	Do.			....	....	

PREVENTION OF POISONING BY LEAD PIPES.

Few persons have become the occupants of a new home without some serious charge against the builder, on the score of drains; the architect, as to the sanitary or other mal-arrangements of the premises; or, failing to trace to either of these personages the cause of some sickness that has seized them, they decry the situation; or, if some sage friend has been consulted, and finds the situation favorable as to the four winds, the substratum is referred to; and then, if clay be the obnoxious foundation, even the pulling down of the house is pronounced useless, as giving no remedy against the existing evil, which has been attributed to so many imaginary causes.

Of all the departments, the plumber's is the least suspected. He goes scot free: for if there be an abundance of water, what blame can attach to him? We do not say that blame *as yet* does attach to him, but we confidently assert that the cause of the evil is often found in his department. The metal which is so pliant under his hands, and can be so easily moulded to his will, with its bright clear face, that seems as if it would throw back with indignation any charge of poisoning, is the culprit after whom the whole house has been in search. In time the hunters are worn out in the chase; and having passed the worst, matters begin to mend; not so much from acclimatization, as the victims suppose, but from the pipes having changed their faces from a leaden hue to one more white; not, indeed, paled from sorrow at the mischief they have done, but from falling in with some companion who has tarried, and in whose society the metal is so engrossed as to cease to exercise a poisonous and deleterious influence over our own.

To those who have not been able to follow our analogy, let us sum up in clearer words.

Lead is soluble in pure water. A solution of lead is highly poisonous. There are cases in which pure water, drawn through leaden pipes, or from leaden cisterns, has carried a sufficiency of the lead in solution to poison a whole family. But a plea of exemption may arise from those who have not pure water. To such we would reply,—Impure water coats the lead, in process of time, with a white film of a carbonate of the metal, which is insoluble, with exceptions; one being the presence of water containing carbonic acid. Such water, in passing through the carbonate of lead, takes up an equivalent of the same, which equivalent may be sufficient to cause distinguishable colic, or set up a non-traceable source of indisposition through a whole family. We now approach the termination of our summary by answering a query that may be put by some skeptics. How is it that, after all, some lead pipes do not poison water? It arises from the fact that old age has wrought a change for the better in their disposition; for when water impregnated with sulphur salts has for a long time passed through leaden pipes, or has long acted on leaden cisterns, the lead becomes coated with a sulphate or a sulphide; and sulphide of lead, being perfectly insoluble in pure water, and equally so in water not too excessively charged with foreign matters to be potable, renders the leaden vehicle perfectly harmless, and thus perfects it for the duties which in all other respects it performs in such a utilitarian manner. But we have a moral to append to our subject. Are we to wait content to be poisoned until our pipes become transmuted, or what are we to do? The remedy is said now to be easily attainable without waiting. Dr. Schwarz, a chemist of Breslau, has made a discovery that cannot be too highly esteemed in a sanitary point of view, which is that by passing a hot solution of the sulphide of potassium through leaden pipes, the interior face is transmuted from the metallic state to that of a sulphide in a few minutes, at a cost too insignificant to mention. If, then, the need of some change in our water conduit be satisfactorily shown (and we have endeavored to do this for years), and the change proposed is based on equally well-known scientific truths; if water in the mines of galena, the sulphide of the noxious metal, be drunk with impunity, let us by all means see that for the future, at any rate, our pipes and cisterns be no longer silent poisoners; but made to support the character they have hitherto not fully deserved, of useful auxiliaries to the requirements of daily life.—*London Builder.*

ON THE CONSTANTS OF GAS ENGINEERING.

(*From the Sanitary Reporter.*)

(Continued from page 109.)

ON THE PRICE OF GAS AS AFFECTED BY THE COST OF COAL AND COKE.

Let us determine a general expression for finding what the price of gas should be (when the price of coal and coke are given), to pay 8 per cent. on capital equal to £5 for each ton of coal.

Put t = cost of one ton of coal, in shillings.

c = selling price of one chaldron of coke, in shillings.

Let 2s. be the sum realized per ton of coal carbonized for tar, ammoniacal water, and old materials. Also, let 12s. be the cost of manufacture per ton of coal carbonized; and let 8s. be the interest to be paid on each £5 of capital; also, let each ton of coal produce for sale 7,750 feet of gas, then—

$$\frac{t - \frac{2c}{3} + 12 + 8 - 2}{7.75} =$$

price of gas per 1,000 feet. This expression, reduced to its simplest form, becomes—

$$\frac{54 + 3t - 2c}{23.25} \quad \ldots\ldots (1)$$

Example:—Let 16s. per ton be the price of coal or value of t, and 9s. be the price of one chaldron of coke or value of c, then,

$$\frac{54 + 48 - 18}{23.25} = \frac{84}{23.25}$$

= 3.61 shillings, or 3s. 7d. per 1,000 feet.

If minute accuracy be not required, we may say

$28 + 1.5\,t - c$ = price per 1,000 feet in pence.

This expression may be analysed thus:

	s.	d.
1. Cost of all expenses per ton	12	0
Less produce from sale of tar, ammoniacal liquor, and old materials	2	0
	10	0

Pence.

Then $\frac{10}{7.75}$ = 1.290s. = 15.48

2. Interest at 8s. per ton of coal annually carbonized.

Then $\frac{8}{7.75}$ = 1.032s. = 12.384

27.864

or, in round figures, 28 pence per 1,000 feet.

The exact expression for the cost of raw material, that is, the cost of the coal, less the coke, is $\frac{t - .66\,c}{7.75}$ in shillings, or $\frac{1.5\,t - c}{11.25}$ and in converting this into an expression in pence, the only liberty taken is to substitute 12 as a denominator for 11.25 in the above fraction. Hence, the expression for pence becomes $1.5\,t - c$, giving, as before, the whole price per 1,000 feet in pence $= 28 + 1.5\,t - c$.

Every addition of 1½d. to the price will increase the dividend 1 per cent.

If it be desired to ascertain the price which will pay 8 per cent. on a capital of £6 per ton, instead of £5, then 30½ must be substituted for 28 in the above expression, and it requires nearly 2d. per 1,000 feet to pay each additional 1 per cent. as the capital.

I have already explained (page 4 of the *Sanitary Reporter*) that where the capital is raised in the most advantageous manner, 8 per cent. on the aggregate capital is equivalent to 5 per cent. on the borrowed capital, and 10 per cent. on the share capital; this being the maximum allowed by Parliament.

Returning now to the simple expression above derived, as to the price at which gas should be supplied, let us take a few examples from the valuable statement printed in the *Sanitary Reporter* of 24th July last. In using the formula, however, we must take care not to apply it to cannel coal companies, as in the case of cannel gas, the circumstances are somewhat different.

The following towns, in each of which the coke per chaldron realizes more than the coal costs per ton, may be taken as examples:

Ashby de la Zouch, Birmingham, Chatteris, Colchester, Dunmow, Leyburn, Marlborough, Oundle, Wolverhampton.

	Pence.
In Ashby coal costs 8s. 6d, and $1.5\,t$ =	12.75
" " working expenses and interest	28.00
	40.75
less coke at 11s. 6d. per chaldron	11.50
	29.25

Gas should be sold at 29¼d. per 1,000.

In Birmingham coal costs 10s. 10d. per ton and $10.83 + 1.5$ =	16.24
Working expenses and interest	28.
	44.24
Less coke, at 11s. 6d. per chaldron	11.50
	32.74

Hence gas should be sold at 2s. 9d. per 1,000 feet, but is in reality sold at 3s. 9d. as a maximum, with discounts, which bring down the price to the very largest consumers, paying ready money, to about 2s. 10d. per thousand feet, the average price being probably about 3s. 6d.

	Pence.
In Chatteris coal costs 16s. per ton and $1.5\,t$ =	24.00
Working expenses and interest	28.
	52.00
Less coke, at 22s. 6d. per chaldron	22.50
	29.50

Hence the gas should be sold at less than 2s. 6d. per 1,000 feet, but is in reality charged 6s. 8d.

	Pence.
In Colchester coal costs 15s. per ton and $1.5\,t$ =	22.5
Working expenses and interett	28.
	50.5
Less coke, at 18s. per chaldron	18.
	32.5

Hence the gas should be sold at less than 2s. 9d. per 1,000 feet, but is in reality sold at 5s.

	Pence.
At Dunmow coal costs 18s. per ton and $1.5\,t$ =	27.00
Working expenses and interest	28.00
	55.00
Less coke, at 30s. per chaldron	30.
	25.00

Hence the gas should be sold at 2s. 1d. per 1,000 feet, but is in reality charged 8s. per 1,000, or nearly four times the proper price.

	Pence.
At Leyburn, in Yorkshire, coal cost 13s. per ton and $1.5\,t$ =	19.50
Working expenses and interest	28.00
	47.50
Less coke, at 18s. per chaldron	18.
	29.50

Here, again, the gas should be sold at less than 2s. 6d. per 1,000 feet, but is in reality charged 8s. 4d., or more than three times what it ought to cost.

	Pence.
At Marlborough the coal costs 16s. 6d. per ton and $1.5\,t$ =	24.75
Working expenses and interest	28.00
	52.75
Less coke at 18s. per chaldron	18.
	34.75

So that the gas should be sold 2s. 11d. per 1,000 feet.

	Pence.
At Oundle the coal costs 10s. 6d. per ton, so that $1.5\,t$ =	15.75
Working expenses and interest	28.00
	43.75
Less coke, at 15s. per chaldron	15.
	28.75

So that the gas should be sold at 2s. 5d. per 1,000 feet, but is in reality charged 7s.

	Pence.
Lastly, at Wolverhampton, the coal costs 9s. 8d. per ton, so that $1.5\,t$ =	14.50
Working expenses and interest	28.00
	42.50
Less coke, at 10s. 8d. per chaldron	10.66
	31.84

So that the gas should be sold at 2s. 8d. per 1,000 feet, but is in reality charged from 3s. 6d to 4s. 6d.

The following are the results collected from the preceding examples:

	Price which should be charged for gas.	Price actually charged.
	s. d.	s. d. s. d.
Ashby-de-la-Zouch	2 5¼	no return.
Birmingham	2 9	2 10 to 3 9
Chatteris	2 5½	6 8
Colchester	2 8½	5 0
Dunmow	2 1	8 0
Leyburn	2 5½	8 4
Marlborough	2 11	no return.
Oundle	2 5	7 0
Wolverhampton	2 8	3 6 to 4 6

ON THE COST OF GAS-MAKING IN SMALL WORKS, SUCH AS THOSE SUITABLE FOR VILLAGES, FACTORIES, WORKSHOPS, AND COUNTRY HOUSES.

Hitherto we have been chiefly occupied with gas-works on the large scale. Let us now turn our attention to works of much smaller capacity.

It is a mistake to suppose that the cost of gas-making on a small scale is comparatively much greater than where the works are of an extensive character. Let us examine, in the first place, the items of expenditure which are avoided in the case of works for lighting private establishments as distinguished from works for lighting towns.

In the first place, the heavy outlay for mains is dispensed with, and this, as a general rule, in gas-works for lighting towns amounts to about one-third of the entire capital. Of course, the whole expense of breaking up streets and repairing and replacing mains, attaching services, &c., is entirely avoided.

Another great difference is, that in small works without street mains, almost the entire loss sustained by large companies from leakage and condensation is avoided.

In addition to this, the following items may be enumerated as forming part of the working expenses in the case of large companies, and in order to show the saving effected in these items, I append the cost of each per ton of coal in the case of the gas companies supplying the metropolis:

	Per Ton of Coal. s.
1. Directors' allowances and payments to auditors	.40
2. Salary of secretary and clerks	.76
3. Collector's commission and pay	.43
4. Rent, rates, and taxes	.89
5. Stationery, printing, &c	.44
6. Ordinary repair and maintenance of mains, services, &c	1.20
7. Restoring and replacing meters	.47
8. Law and Parliamentary charges	.35
	4.94

Thus, nearly 5s. per ton out of the whole 13s. which it now costs the London companies to manufacture gas, ought to be saved in small establishments where there are no mains to keep up, and where the numerous incidental charges of a public company are avoided.

Exclusive of raw material, the whole expenditure in these small works may be summed up under the following heads:

1. Materials for purification.
2. Labor.
3. Wear and tear of retorts.
4. Sinking fund for renewal of plant when worn out.
5. Interest on outlay at 5 per cent.

The subjoined very valuable statistics on the subject of small gas-works, have been published by Mr. Bower, of St. Neots, who has erected many hundreds of such works in all parts of Great Britain and the Continent, and whose extensive experience and eminent success entitle his opinions to much weight

ANALYSIS OF BOWER'S ESTIMATES FOR GAS-MAKING.

100 lights, each four hours a day, = 400 hours, each using 3 feet an hour, = 1,200 feet a day.

Coal required, 2¾ cwt. Then 2.75 : 1,200 : : 20 : 8,000 feet.

8,000 feet per ton of coal:

			Per 2¾ cwt. s. d.	Per ton. s.
Daily outlay for		lime	0 2	1.21
Do.	do.	labor	1 0	7.27
Do.	do.	wear and tear of retorts	0 6	3.64
Do.	do.	renewal of plant 2½ per cent.	0 4½	2.73
			2 0½	14.85

Coals per annum $2\frac{3}{4} + \frac{200}{20} = 27\frac{1}{2}$ tons a year.

Cost of works $\frac{367}{27.5}$ = £9 14s. per ton.

Estimate for 4,800 feet a day:

11 : 4,800 : : 20 : 8,889 feet per ton.

	11 cwt. s. d.	1 ton. s.
Lime	0 8	1.21
Labor	5 0	9.09
Wear and tear of retorts	2 6	4.55
Renewal, 2½	0 10½	1.59
	9 0½	16.44

Coals per annum, 110 tons.

Cost of works $\frac{£542}{110}$ = £5 17s. per ton.

Estimate for 12,000 feet per day.

28 : 12,000 : : 20 : 8,571 feet per ton.

	For 28 cwt. s. d.	Per ton. s.
Lime for purification	2 0	1.43
Labor, two men by day, and one by night	7 6	5.36
Wear and tear of retorts	4 0	2.86
Renewal fund 2½ per cent.	1 6	1.07
	15 0	10.72

Coals, 280 tons a year, costs $\frac{1069}{280}$ = £3 16s. per ton of coal.

In each of the three preceding estimates, the coal is assumed to cost 20s. per ton, and coke to realize the same, or about 13s. 6d. per chaldron. If these were ordinary gas-works for the supply of a town according to the formula at page 97, the price of gas should be 28 + 1.5 + 20 — 13.5 = 3s. 8½d. per 1,000 feet, to pay 8 per cent. on the capital. As Mr. Bower only allows 5 per cent. on the capital, 4½d. must be deducted for this, leaving 3s. 4d. per 1,000 as the cost of gas per 1,000 feet, to pay 5 per cent. on the capital when the price of coal is 20s. per ton, and when coke realizes 13s. 6d. per chaldron.

Now, this price per 1,000 feet is half way between Mr. Bower's price of gas in works producing 4,800 and 12,000 feet per day; so that it will not be far wrong to assume that for small works producing 8,000 or 10,000 feet a day, the price of gas is not greater than for towns in which mains are required, and in which there are all the usual equipments of a large company.

On the other hand, when the private establishment becomes greater in productive power than 10,000 feet a day, the cost of making gas is even less than in a town of large size. This is shown in Mr. Bower's estimate for works producing 12,000 feet a day, where the cost of making the gas, including all incidental charges and interest on capital, is only 3s. per 1,000 feet, when coal and coke are each worth 20s a ton.

Calculations showing the maximum cost of gas per 1,000 cubic feet, with Newcastle or other coal, at 20s. per ton, for 200, 400, and 1,000 lights, each burning for four hours per day, inclusive of wear and tear, interest on capital, and a sinking fund for renewal of the plant when worn out.

N. B. It is scarcely necessary to observe that the cost of the gas will be more or less,—varying with the price of coal.

100 LIGHTS, burning for 4 hours per day, and each light consuming 3 cubic feet per hour, will require 1,200 cubic feet.

Daily Outlay.

	£ s. d.
Coal, 2¾ cwt., at 20s. per ton	0 2 9
Lime for purification	0 0 2
Labor (part of a man's time)	0 1 0
Wear and tear of retorts, &c	0 0 6
Interest on outlay at five per cent	0 0 9
Fund for renewal of Plant, when worn out, at 2½ per cent	0 0 4½
	0 5 6½

Residual products to be deducted.

	£ s. d.
Coke, all used as fuel	
Tar	
Ammoniacal water	
Total cost of 1,200 cubic feet	£0 5 6½

NET COST OF GAS PER THOUSAND CUBIC FEET IN THE GAS-HOLDER, FOUR SHILLINGS AND EIGHT PENCE.

TOTAL AMOUNT OF CAPITAL REQUIRED,
Assuming that all New Buildings have to be provided.

	£ s. d.
Price of apparatus delivered and fixed complete, as per specification	135 0 0
Fire bricks and lumps for setting retorts	7 0 0
Buildings, consisting of retort house and stack, tank for gas-holder, &c. (bricks, 25s. per 1,000)	125 0 0
	£267 0 0

400 LIGHTS, burning for 4 hours per day, and each light consuming 3 cubic feet per hour, will require 4,800 cubic feet.

Daily Outlay.

	£ s. d.
Coal, 11 cwt., at 20s. per ton	0 11 0
Lime for purification	0 0 8
Labor, one man per day and one per night	0 5 0
Wear and tear of retorts, &c	0 2 6
Interest on outlay at five per cent	0 1 9
Fund for renewal of Plant when worn out, at 2½ per cent	0 0 10½
	1 1 9½

Residual Products to be deducted.

	£ s. d.
Coke,—3 cwt. more than is required for heating the retorts, at same price as coal	0 3 0
Tar, 5 gallons } Ammoniacal water, 5 gallons }	0 0 6
	0 3 6
Total cost of 4,800 cubic feet	£0 18 3½

NET COST OF GAS PER THOUSAND CUBIC FEET IN THE GAS-HOLDER, THREE SHILLINGS AND NINE PENCE.

TOTAL AMOUNT OF CAPITAL REQUIRED.
Assuming that all New Buildings have to be provided.

	£ s. d.
Price of apparatus delivered and fixed complete, as per specification	370 0 0
Fire bricks and lumps for setting retorts	22 10 0
Buildings, consisting of retort house and stack, tank for gas-holder, &c. (bricks, 25s. per ton)	250 0 0
	£642 10 0

1,000 LIGHTS, burning for 4 hours per day, and each light consuming 3 cubic feet per hour, will require 12,000 cubic feet.

Daily Outlay.

	£ s. d.
Coal, 28 cwt., at 20s. per ton	1 8 0
Lime for purification	0 2 0
Labor, two men by day and one man by night	0 7 6
Wear and tear of retorts	0 4 0
Interest on outlay at five per cent	0 3 0
Fund for renewal of Plant when worn out, at 2½ per cent	0 1 6
	£2 6 0

Residual Products to be deducted.

	£ s. d.
Coke,—9 cwt. more than is required for heating the retorts, at same price as coal	0 9 0
Tar, 15 gallons } Ammoniacal water, 15 gallons }	0 1 6
	0 10 6
Total cost of 12,000 cubic feet	£1 15 6

NET COST OF GAS PER THOUSAND CUBIC FEET IN THE GAS-HOLDER, THREE SHILLINGS.

TOTAL AMOUNT OF CAPITAL REQUIRED.
Assuming that all New Buildings have to be provided.

	£ s. d.
Price of apparatus delivered and fixed complete, as per specification	640 0 0
Fire bricks and lumps for setting retorts	28 10 0
Buildings, consisting of retort house and stack, tank for gas-holder, &c. (bricks, 25s. per 1,000)	400 0 0
	£1,068 10 0

NOTE.—Where steam is required, the cost of the gas may be materially reduced by setting the retorts alongside the boiler, and arranging the flues so that the waste heat from them may aid in generating the steam.

THE AMERICAN GAS-LIGHT JOURNAL is published on the 1st and 15th of every month, and is the recognized official organ of

LIGHT, HEAT, WATER-SUPPLY AND SEWERAGE.

Its purpose is to ascertain and make known all new discoveries in the science and economical application of LIGHT, and promote thereby the interests of companies and consumers; to encourage and aid the introduction of PURE WATER from Lakes and Rivers into Towns and Cities, and to improve the system of SEWERAGE, VENTILATION, HEATING, and DRAINAGE everywhere.

THERE ARE 20,000 CITIES AND TOWNS IN THE UNITED STATES, CAPABLE OF SUPPORTING GAS-WORKS, WHILE THERE ARE NOT 400 GAS-WORKS IN OPERATION IN THE WHOLE COUNTRY!!!

TERMS—CASH IN ADVANCE.

SUBSCRIPTION—In the U. S. and British Provinces, $3 per annum. In Great Britain, 12s. per annum, payable in British post-office orders, remitted to the Editor, as below.

ADVERTISEMENTS—According to position and space occupied.

☞ Remittances by mail to be addressed to the Editor,

C. ELTON BUCK,

ROOMS of the AMERICAN GAS-LIGHT JOURNAL,

No. 39 Nassau st., cor. of Liberty st., opposite the Post-Office, New York City.

AGENTS OF THE AMERICAN GAS-LIGHT JOURNAL

FOREIGN.

Germany .....B. WESTERMAN & Co., of New York.

Great Britain....TRUBNER & Co., 60 Paternoster Row, London, where single copies may always be found,

Paris, France. .. } LE JOURNAL DE L'ECLAIRAGE AU GAZ, 25 Boulevard Poissonnière.

DOMESTIC.

V. HAROLD MYERS, No. 152 South Fourth st., Philadelphia.

The AMERICAN GAS-LIGHT JOURNAL can be purchased of all the newspaper and periodical dealers in the U. States and Canadas.

THE

AMERICAN GAS-LIGHT JOURNAL,

PUBLISHED ON 1ST AND 15TH OF EVERY MONTH.

C. ELTON BUCK, ... EDITOR.

THURSDAY, OCTOBER 15, 1863.

The beneficial effects of association have been abundantly exemplified by the results attending the stated gatherings of societies having for their object the diffusion of knowledge, and the advancement of certain branches of the arts. The periodical meetings of such bodies as the American Association for the Advancement of Science, and of its British prototype, whose sessions have but recently closed, afford a practical demonstration of the benefits accruing from the interchange of ideas, and the personal reunions of men distinguished in their respective professions. At such gatherings, not only are the members of these associations brought into closer bonds of friendship with those whom under other circumstances they might never have met; but, by the comparison of ideas, by mutual additions to the general store of information, by the general diffusion of the personal experience of the members, and in many other ways, the common stock of knowledge is increased by individual contributions, and thus becomes the property of each associate. Nor do the beneficial results stop here. By the publication of the papers prepared for the meetings of these associations, and by the discussions which their reading gives rise to, the public mind is supplied with valuable stores of information, and the wide extent of the influence of such societies is thus proved. As an evidence of this, take the annual meeting of the British Association for the Advancement of Science, recently held at Newcastle. A large concourse of savans, from all parts of the kingdom, attended its sessions; papers of great value were read, and much important information was diffused. The advantages of this meeting extended far beyond the comparatively limited sphere of its membership, for the proceedings were published in the daily journals, and thus found their way into almost every household. Our English exchanges come to us laden with the reports of the papers which were read, and discussions which occurred, in which and many new and important truths were promulgated. We cite this instance, as being more recent than the meeting of our own American Association, and likewise, because its scope is wider and more practical in its nature.

Passing from the consideration of a society devoted to the propagation of general science to one dedicated to a special branch of technology, the same arguments may be used to show the benefits which may be derived, even though in a more limited sphere.

We have been frequently impressed with the importance of an association to be composed of gas engineers and superintendents, and in our last number, while referring to the recent meeting of the Association of Gas Engineers of Scotland, we briefly hinted at the propriety of forming an American association of a similar nature. This idea was suggested and urged in the columns of this JOURNAL, in the first year of its existence, and at the time was received with great favor, but from some reason or other, no formal meeting was inaugurated. Since our last number was published, we have observed in the columns of an English contemporary, a letter on the desirableness of forming a British Association of Gas Engineers. The writer's views coincide so entirely with our own, that we give the following extract from his letter:

"The chemical and engineering professions have their associations; indeed, the latter has no less than three—civil, mechanical, and the foremen's. In some of these, and in the Society of Arts, British Association, geological and kindred societies, most of our leading men, I believe, are to be found; indeed, their support was given but a few years ago, to a gas-fitters' association, thus evidencing that if a proper position be taken, and not too much attempted, or expected, *a British Association of Gas Engineers* will not lack supporters. * * * What appears to me to be wanted, is a general meeting of gas men once a year, at which the leading subjects of interest to the gas trade might be discussed; not by set orations, but in a simple, business-like manner; and that any new discovery, invention, or patent, might have publicity given to it, and the advantage of being seen in operation. Two days would be ample time for this, as well for the renewal of old professional friendships, and the formation of new ones. The society might meet in different cities or towns each year, and one or two of the principal ones in the neighborhood might be visited; and at the place of meeting a general exhibition might be held of plans, models, apparatus, and a selection of fittings. * * * The business of such a society could, comparatively, be easily and inexpensively transacted."

These words apply with equal force to this country. Indeed, the necessity of such an association is even greater here than in England. The science of gas-making is here comparatively in its infancy, while in England it is an old story, and its principles are there more widely diffused because of the much larger number of gas-works in existence. Here the field has not yet been fully occupied, and many towns and villages will yet have to be lighted with gas, where now oil and candles are the sole source of artificial light. The future engineers of these prospective gas-works, in order to conduct them with efficiency, must needs be educated to the demands of their position, and an association, such as we speak of, would go far towards smoothing their path and making their way plain.

If the sole purpose of an association of gas-engineers were to make the members become personally acquainted, a great object would be gained. An annual meeting of the gas engineers of our vast republic, if merely for the interchange of social courtesies, would be attended with great benefits. In social conversation the "shop" would be sure to come up for discussion, and as this topic would be congenial to all the members, even in the rambling discourse incident to a friendly re-union, much valuable information would be diffused.

The benefits resulting from a National association based upon the right plan—meeting together at stated intervals, and conducted with a liberal and open spirit—would soon be appreciated. That such an association is needed, we are almost daily convinced. The letters which we receive from superintendents from all parts of the country, making inquiries relative to various matters connected with their labors, show the need there is for some plan of diffusing information by personal interview. There are many ways of doing this through the intervention of such a society, which can be done in no other manner. Members of associations connected with other branches of technology will readily appreciate our meaning. Instead of being dependent upon one source of information, every member of the association becomes an advisor, and as—"in a multitude of counsellors there is wisdom"—so by seeking one piece of information from a number of adepts, the combined experience of all may be made available.

But it is useless to enlarge upon the benefits which would surely accrue from the formation of an association like that we have been considering. The advantages of such a congress must be apparent to every unprejudiced reader, and we leave the subject for their consideration. As to whether the proper time has come to move in the matter, they are the best judges, and we commend the question to them, in the hope that ere long we may have an association of which the profession shall be proud, and which shall be productive of great results.

PETROLEUM-GAS *vs.* COAL-GAS.—The article on this subject, which appears in another column, is from the pen of a gentleman who has had probably a greater experience in gas made from liquid hydrocarbons than any others of our numerous readers. Although the opinions he expresses differ from the views we have recently advanced, we cheerfully publish them and commend them to the consideration of gas-engineers. We have no prejudice either for or against petroleum-gas, although we cannot believe it will ever supersede coal-gas to any extent. The subject is an interesting one, and one which has elicited much discussion.

LUNKENHEIMER'S PATENT ADJUSTABLE GAS BURNER.—We call the attention of our readers to the advertisement of Mr. F. Lunkenheimer, which may be found in another column. We have examined the burner patented by this gentleman, and it seems well calculated to accomplish all that he claims for it. By simply adjusting it so as to suit the varying pressure on the street mains, a regular and uniform flame may be obtained, and blowing entirely prevented—thus freeing the consumer from the annoyance caused by burning gas at a high pressure, and rendering the light pleasant to the eye. These burners are extremely neat in appearance, and can be readily attached to any gas fixture, where upon trial their merits will be appreciated.

REDUCED GAS-LIGHTS.—Fire Marshal Baker, in a recent report, thus speaks of the danger attending the practice of lowering gas-lights:—"Many persons have a habit of lowering the gas-light in their bed-rooms to a faint jet at night. This, to say nothing of its pernicious influence upon the health, may be productive of serious accidents. When the gas is reduced so low, a very slight cause—the buzzing of a fly even—will serve to put it out, and the sleeper is left to inhale a poisoned atmosphere, or to incur the risk of an explosion should any one chance to enter the room with a light. Where gas-lights are thus lowered, a glass should always be used as a protection to them. Many fires have occurred in consequence of the dim light, not noticed after sunrise, on the window being opened by the occupant or servant; the curtain is blown against the burner and a fire ensues."

SAFETY LAMPS.—Mr. J. Dickinson, the Inspector of Mines for the North and East Lancashire district, in his report for the year 1862, just published, states that in coal mines, amongst the men, there is a great dislike to work exclusively with safety lamps. The lamps are not so handy, and do not give so good a light as a candle, which prevents the workman from getting on with his work.

GAS EXPLOSION IN A THEATRE.—A powerful explosion took place at 8 o'clock on Friday evening at the New York Theatre, corner of Broome and Broadway, which resulted from a defect in a bag used for holding gas, and which was in the basement of the buiiing. This bag was used to produce a portion of the illuminating effects in the working of the ghost, and was partially filled at the time. The explosion made a very loud noise, shook the building, and broke the glass. The audience rushed out wildly, but returned shortly afterward, when the performance was resumed.

FINANCIAL.

Wednesday Evening, October 14th, 1863.

As we predicted a few weeks ago, the present month has shown greater activity in the movements of city gas-light shares, than that which has characterized any previous month since last spring. A large amount of *Manhattan* and *Metropolitan*, N. Y, shares, have been thrown on the market, at public as well as private sale. On October 3d, the following figures were obtained:

100 shares Manhattan Gas Light Co	$50 each 257
100 Manhattan Gas-Light Co. Scrip	222 to 226
175 Metropolitan Gas-Light Co.	$100 each 136

Surely, figures like these betoken a value which is unmistakeable, and the public show an appreciation of the soundness of such securities, by the readiness with which they attend such sales, and the avidity with which they bid off the shares as they are announced. These prices are maintained, too, in the face of the rumors which are daily gaining ground, to the effect that a new and powerful rival to the existing gas-light companies is about to appear.

On Saturday, October 10th, a few *Manhattan* and *Metropolitan* shares were likewise offered at public sale, and brought figures about equal to those quoted above.

Not only in this Metropolis are gas-light securities in demand, but in other places they are regarded in the most favorable light as an investment. Even in New Orleans, La., where the depressing effects of rebel rule had well nigh ruined every interest, the shares of the gas-light company are scarce and in demand, at 122 per cent. The *Era*, of that city, states that a large amount of this stock could be sold, but holders are not willing to part with it.

Among other shares now on the market, we notice a parcel of *Lafayette*, Ind., a very good stock. Also, parcels of *Paterson*, N. J.

We have very flattering accounts of some of the gas-light companies in the State of California, and quite a number of new works are being built. In some of the neighboring territories—Colorado, for instance—the recent discoveries of mineral wealth will draw a large population, and a demand will be created for many things essential to comfort. Among these, gas works must be enumerated. At Virginia City, in Nevada, where, as we recently mentioned, gas-works are being built, the population is already 20,000, and if the tide of immigration continues, it will soon largely outnumber this amount.

ANSWERS TO CORRESPONDENTS.

C. B. C., of Pa.—*Thallium was discovered in* 1861 *by Wm. Crookes, Esq., F. R. S., of London, the accomplished editor of the Chemical News, and although he has clearly proved the priority of his researches on the properties of this metal, his claims are disputed by a chemist named Lamy. We think that the entire credit of adding this interesting metal to the family of the elements, belongs to Mr. Crookes, and believe that our opinion will be concurred in by the greater number of Mr. Crookes' professional brethren.*

A. H. P., of R. I.—*Your request has been duly responded to by the party you mentioned, and you will soon be apprised of the result.*

E. L. B., of Me.—*We cannot tell. There were many disputes concerning the question, which were never satisfactorily settled. To agitate the subject again, would only be to open an old wound, and for the sake of peace, it is better to drop all allusions to the matter.*

S. F., of N. Y.—*Try a lower pressure, and we think you will succeed better.*

G. T. Y., of Md.—*The specimen is fair—nothing more. Whether it will succeed will only appear on experimenting with it on a large scale.*

E. W. S., of Ill.—*We believe the owner of the works is now in Germany, and it is quite probable that he may remain there. He is interested in a number of German gas-works, and has gone out there to look after his interests in that quarter.*

L. H. G., of Mich.—*Due notice will be given in the colums of this* JOURNAL. *We do not look for an early announcement, as experiments are still in progress, which may consume much time, and many difficulties will have to be overcome.*

C. C. J., of Ky.—*Your reasons are mainly good, but we cannot see the force of all of them. We should be glad to read your paper, and if we can afford you any assistance, we shall be happy to do so.*

G. S., of Ind.—*We cannot admit anything of a personal nature into our columns. Your criticism is not only harsh, but the language you use is ungentlemanly and rude, and ought never to be uttered—much less be allowed to appear in print.*

CORRESPONDENCE.

LENOIR'S GAS ENGINE.

PARIS, FRANCE, September 16, 1863.

To the Editor of the AMERICAN GAS-LIGHT JOURNAL:

The most interesting subject to the European gas-world, at present, is Lenoir's gas-engine, which is pronounced a decided success. A two-horse engine is on exhibition in a neat little store in *Le Passage des Princes*, on the *Boulevard des Italiens*, and attracts great attention. It is started early in the morning, and runs until the place is closed at night. Crowds visit it daily. I have been there several times, and with the permission of the superintendent, have experimented with it by slowing, rushing, stopping, and starting it at pleasure. I have also visited the factory in the *Rue de la Roquette*, where I had the pleasure of seeing Mr. Lenoir, a very intelligent, active, industrious mechanic, of about 35 years of age, who superintends the building of the engines. Orders are now in hand for some 1,200, of various sizes, for France alone, while the branch companies in England, Russia, Holland, &c., are making others for those countries. It is remarkable that Lenoir has never read a book on motion—his ideas are entirely original. You are probably aware that he has sold his interest to a company, from whom I have obtained a concession to establish a company and manufactory in the United States, the headquarters of which will be the office of the AMERICAN GAS-LIGHT JOURNAL.

The details of running the *Moteur Lenoir*, will be given in a future letter. The American gas-works will gladly welcome this new and valuable customer for their useful product. *Le Moniteur* newspaper, of Paris, is printed by one of Lenoir's engines, and the Grand Hotel has three of them in operation, lifting passengers' luggage, raising water, and distributing it throughout the vast establishment, *turning the ice-cream freezer!* carrying the clean dishes up to the dining-room, and bringing the dirty ones down, all of which I saw done. The Hotel superintendent told me he was more than satisfied with them, and the expense is but one dollar and a half each per day.

I have also visited the estensive works of *L'Usine a Gaz Portatif de Paris*, the portable gas-works, at No. 104 *Rue de Charonne*, where the gas is made of the Boghead coal exclusively, the retorts being very small, about four feet long and eight inches high. The process is, of course, the same as elsewhere, but the gas is forced into cylinders, in wagons, at a high pressure, and then transferred from these into smaller cylinders at the houses of their customers, at a less pressure. The company is doing well, very well; paying 7 per cent. dividends, besides extending their works and laying up a surplus, but this was seriously impaired a couple of years since by an explosion of the cylinder at the *Casino*, the Lorettes' dancing hall, in Paris. It happened, fortunately, when no one was present.

These portable gas-works likewise belong to a company whose shares rank high as a permanent security at the Bourse.

I had the pleasure of seeing Professor Campbell Morfit, late of New York, a day or two ago. He has a beautiful house on *l'Avenue de l'Imperatrice*, near *l'Arc de Triomphe*, his laboratory being a short distance from Paris. He tells me that he is doing a large analytical business for England and France, and making money.

You may probably remember that it is to Professor Morfit that the readers of the AMERICAN GAS-LIGHT JOURNAL are indebted for its present editor.

Another invention, which I was invited to examine, is a machine for supplying petroleum oil to chandeliers, through pipes similar to gas pipes. The machine resembles a small gas-meter, is beautifully made, and placed anywhere in the room, the ornamental ones on the mantel piece. Being filled with oil, the clock-work inside is set in motion, when it forces the oil through the pipe into a well in the chandelier, which is provided with a regulator that preserves the level of the oil, and prevents an overflow.

A company owns this patent, and are already manufacturing the machines. I have suggested Mr. George H. Kitchen, the well known lamp and chandelier manufacturer, of Broadway, New York, as an intelligent and entirely responsible agent for this company, and they have promised to send a machine and the drawings at once, to your care, to be submitted to him.

I have called twice at the General Gas-Works of Paris, but was so unfortunate as not to see the director, who was at breakfast each time—1 P. M. I saw the engineer, who said there was nothing new in the gas-world, in France, and from what I see and hear of the poor quality of the gas of Paris, it is evident the gas company is not yet fitted to be a teacher. We are far ahead of both England and France in this respect,

Mr. Roome, the venerable president of the Manhattan Gas Company, is looked upon here with great reverence, as well for his thorough knowledge of practical gas making, as for his successful career in the profession.

The King of Portugal is at the Grand Hotel, —— and so am I; but Paris is safe. M.

GAS IN ENGLAND.

A new gas company has been formed for the additional supply of Guildford, Godalming, Shalford, and neighborhood, with gas at a rate not exceeding 5s. per 1,000 cubic feet. The attendance at the meeting of gas consumers and others to form the company was both numerous and influential, and those present, by their resolutions, appear to be determined to carry out their object, and so procure a supply of gas for themselves both cheaper and better, as well as more abundant in quantity than the old company has heretofore supplied. Captain Mangles occupied the chair, and Mr. Hughes gave an elaborate and able exposition of the state of matters, and carried the feeling of the meeting entirely along with him, the result being a series of resolutions for the immediate formation of the company,

It is stated by Mr. Flintoff, in his lectures on gas-lighting, about to be published, that there are in the metropolis thirteen gas companies, having twenty-three stations for the manufacture and sale of gas. The capital invested is £5,801,815 3s. 8d. The amount received for gas alone in 1862 was £1,498,569 15s., so that the quantity *paid for* by the public would be six hundred and sixty millions of cubic feet. During the same period the coals used cost £7,285,552 0s. 1d., which yielded £335,411 5s. 10d. for coke, tar, and ammoniacal liquor, so that the cost of coal, fuel, for generating, and leakage and losses in transmitting one thousand feet of gas from the works to the consumer, is only 1s. 2¼d.

The Bristol Gas Company have announced their intention of reducing the price of gas, from the 1st of January next, from 3s. 9d. to 3s. 6d. per one thousand feet.

At the half-yearly meeting of the proprietors of the Birmingham Gas Company, the usual maximum dividends were declared, and the affairs of the company were reported to be in a satisfactory state.

At the annual general meeting of the shareholders of the Downpatrick Gas Company a dividend at the rate of 6 per cent. was declared payable on 1st October; and a resolution passed to reduce the price of gas to consumers, to 6s. 8d. per 1,000 feet, on all gas supplied from the 1st January next.

At Great Bardfield, it is proposed to erect gas-works at a cost of £1,000. A company is being formed for the purpose.

At Portland, the gas-works are progressing under the superintendence of the engineer, Mr. John H. Little of Newcastle-upon-Tyne.

GAS IN WALES.—A meeting has been recently held in the town of Machynlleth, at which it was resolved to erect gas-works for the town. A company with a capital of £2,000 in £5 shares is being formed.

ON THE RESULTS OF THE USE OF CLAY RETORTS FOR GAS-MAKING.

BY JABEZ CHURCH, ASSOC. INST. C. E.

The following highly interesting paper was read by Jabez Church, Esq., of Chelmsford, England, at a recent meeting of the Institution of Civil Engineers. The data which it contains will be found valuable to all gas-engineers.

Among the various improvements which have been introduced in the construction of apparatus for manufacturing coal-gas, the use of clay instead of iron for retorts is, perhaps, nearly the most important, and is thus worthy the consideration of this institution.

Brick and clay retorts have been tried at different periods, and with various success. In the winter of 1826, and the beginning of 1827, Broadmeadows' patent was brought into operation by the late Mr. David Gordon, the introducer and patentee of compressed gas, and a paper on the subject is contained in the archives of the institution. This compressed gas was obtained from coal-gas made at Manchester, by Mr. Alexander Gordon, M. Inst. C. E., with retorts constructed of bricks, Welsh lumps, and Stourbridge clay.

Mr. A. Gordon states that the defect of the system in question was, that, as they had to work with a very slight oscillation of the barometer, or water-gauge, by Broadmeadows' apparatus, they sometimes blew gas through the joints of the brick retorts or ovens; whilst, at other times, the ovens inhaled atmospheric air, in consequence of the exhausting apparatus being worked too rapidly. The inhalation of atmospheric air was too important to be overlooked, and it became necessary to lay aside Broadmeadows' plan.

Mr. Grafton appears to have been the first to adopt fire-clay as a substitute for metal, in the construction of retorts; this was in the year 1820. The retort was at first of a square form, in the transverse section, but it was soon afterwards changed to that of D, or oven shaped, which form has ever since been adhered to, both in this country and abroad, and such retorts have been extensively employed. Mr. Clegg, in his treatise on coal-gas, speaking of these retorts, observes, "They can be constructed either to be heated by coke ovens, or coke furnaces, or by the burning of tar; with coke ovens they are more durable." They "have great power to retain their heat, when brought to the proper temperature for decomposing the coal, and the introduction of a fresh charge is not nearly so much felt by them as by metal; this is a practical point, one which I have been at much pains to ascertain, and which I would not state, were I not convinced of its correctness by personal observation." He further states, that "this power of retaining heat is proved by constant practice to produce 1,000 cubic feet of gas per ton from the same coal more than the average of the London produce, and the consumption of fuel is not more than 22 lbs. or 23 lbs. of coke to carbonize 100 lbs. of Newcastle coal, taking the average of six months' working; it is even less with the Staffordshire or Lancashire coal. When properly constructed these retorts are not in any degree liable to fracture, or to the escape of gas, but are of such strength as to resist the greatest pressure which is likely to be put upon them. The coke also made by them is invariably of better quality, and produces less breeze or waste." In speaking of the durability of the fire-clay retort, he says, "In some instances it has lasted for the extraordinary period of twelve years; while, during this time, at all other works where the invention is not yet used, it may be asserted that iron retorts have been renewed as many times."

In Scotland clay retorts were adopted at a very early period, and they are now in general use there.

According to the experience of the author, in different towns, the comparative quantities of gas made by iron and clay retorts, of the D form, and equal in size, that is, 15 inches by 13 inches on the cross-section, and 7 feet 6 inches in length, are as follows:

The duration of the iron retorts for 365 days, working off 1¼ cwt. of coal for each charge, was equal to the carbonization of 2,190 cwt. of coal, which, at 9,000 cubic feet of gas per ton, gives a total quantity of 985,500 cubic feet of gas per retort; whilst the clay retorts worked 912 days, carbonizing 5,472 cwt. of coal, which, at 9,000 cubic feet of gas per ton, gives 2,462,400 cubic feet of gas per retort. The clay retorts are capable of yielding a greater quantity of gas, from the same quantity of coal, than the iron retorts, but the specific gravity of the gas so made is less, and its illuminating power is diminished in consequence of the increased temperature of the clay retorts above that of the iron retorts. Such an increase of temperature upon an almost exhausted iron retort would cause the metal to melt, whilst the clay retort would be unaffected by the degree of heat, when the great body of gas yielded by the charge has passed off. The want of illuminating power in the last portion of gas, it is well known, is owing to the gas being decomposed by the higher temperature of the retort, when part of its carbon becomes deposited; but it is to be remembered that when the same quantity of gas is produced from equal quantities of coal, the gas in each case will possess the same illuminating power, whether carbonized in iron or in clay retorts. Of the three forms of clay retorts usually employed, namely, the circular, or round, the D, or oven shape, and the elliptical, the D shape is to be preferred, because this form of retort admits of a stratum of coal being distributed of an equal thickness throughout; but the form of retort must in some cases be regulated by circumstances, and it is not unusual to have these three forms of retort placed in the same bed. The cost of setting the clay retorts is in some case even as much as 20 per cent. less than that of iron retorts, on account of the former not requiring any tiles or shielding like the latter, so that there is a consequent reduction of labor and material. In small works the clay retorts are used without an exhauster.

When that machine is not used, it is necessary to work at as low a pressure as possible upon the retort; but it is found in practice that they may be profitably worked at a water-gauge pressure of 7 inches. Should the pressure be increased beyond this point, a perceptible leakage takes place through the pores of the retorts, and this leakage will always be in proportion to the pressure. At an increased pressure leakage continues for a considerable period, or until the pores of the retort become filled by a deposition of carbon taking place within them, throughout the entire mass of the retorts, evidence of which is perceptible by breaking a retort that has been working under the circumstances described.

The most practical method of working clay retorts in large works is with the addition of an exhauster, the operation of which reduces the pressure on the retort, by drawing off the gas before there is time for an accumulation of pressure to take place within it.

The further advantage of an exhauster is, that by taking the pressure off the retorts the quantity of gas is increased about 200 cubic feet per ton of coal, the gas not being then forced through the fissures and pores of the retort, as when the pressure has the power of increasing in the absence of an exhauster. The same advantages would apply to small as well as to large works by the use of an exhauster; but the expense of an exhausting apparatus, and steam machinery to work it, would not in the former case be compensated by the gas saved.

It is well known that the deposition of carbon, from the decomposition of gas at a high temperature, is more abundant in clay than in iron retorts, owing probably to the greater temperature which the former acquires over the latter. Yet it is to be observed that, as far as the working is concerned, one retort may apparently be subject to the same conditions as another, but still one of them will be more encrusted with carbon than the other; this may be attributed to the surface of the one which deposits the carbon being rougher than the other. An experiment was made with twenty D-shaped retorts, set in four beds of five each. They were all worked at the same temperature, charged with the same quantity of Newcastle coal, placed on the same range, and were subject, in every particular, to the same conditions.

During these experiments the resistance offered to the gas, in its passage through the purifiers, and by the weight of the gasometers, or gas-holders, was equal to a column of water of seven inches, by the gauge attached to the ascending-pipe near the mouth-piece. The result was that ten retorts, during the time referred to, had a large accumulation of carbon, amounting in weight to nearly 1 per cent. on the quantity of coal used, whilst the other ten had only a very small accumulation of carbon. These retorts were made by the same manufacturer in the neighborhood of Newcastle; but ten were made from one seam of clay, and the other ten from clay of a different quality. In the one case the interior of the retorts in which there was the lesser deposit was evidently much smoother than the interior of the retorts in which there was the greater deposit.

Hence, it is concluded that the deposition is partly regulated by the nature of the surface, and that it is necessary that the interior of the retorts should be more carefully finished, so as to insure a smooth surface, for which purpose a proper quality of clay should be selected.

When clay retorts are worked with an exhauster, they are not so liable to the deposition of carbon as when worked without an exhauster; and a smooth surface with an exhauster possesses the same advantages as a smooth surface without an exhauster. As the structure of the mass of carbon deposited in the retorts is always laminated, the principal portion of the carbon appears to separate from the gas at the earlier period of working the charge of coal, and ceases to be separated towards the latter part of the time, so that every time the retorts are charged and worked there is a distinct layer of carbon thus formed, which accumulates upon the previous layer.

The quantity of carbon which thus becomes gradually deposited within the retort at last requires to be removed, as the area of the retort is so considerably diminished as to prevent the full charge of coal being introduced. The removal of this carbonaceous incrustation, on account of the fragile nature of the clay retorts, requires to be conducted more carefully than in the case of iron retorts. It is necessary, both with clay and with iron retorts, to admit atmospheric air, which has the effect of rendering the carbon capable of being detached, by means of chisel-ended bars. When the retorts are long and have a lid at each end, the air can be at once admitted by removing the lids, but in short retorts having only one lid, the usual plan is to partially remove the lid from the mouth-piece of the retort, and to let it remain in this state until the current of air, which established itself through the retort, renders the carbon capable of being easily detached. This process, in some cases, requires to be carried on from 9 to 30 hours before the removal of the carbon can be effected. The author has tried various means of accomplishing the object in question, and finds the following to be the easiest as well as the quickest method. An ordinary lid, provided with a hole, as near the lower part as practicable, and large enough to admit a fire-clay pipe three inches in diameter, is luted on in the ordinary way. The blank flange at the top of the ascending-pipe leading to the hydraulic main is then removed, and a temporary connection is made with this pipe to another iron-pipe of similar diameter, the other end of which is made to terminate in the main flue of the retort-stack, leading to the chimney-shaft. The clay pipe being passed through the orifice in the lid, is placed in such a direction that the end within the retort shall cause the current of air which is drawn through it to impinge upon the mass of carbon which it is intended to remove. The inclination of this pipe can be changed from time to time, so that the air may be made to play successively over the whole surface of the carbonaceous mass. A clay pipe is preferred to one of iron, because the latter would be rapidly oxidized. The advantage of this method is, that it requires only half the time for the removal of the carbon. This is of importance, as the longer the retorts are subjected to the action of cold air within, the more they are liable to suffer by becoming cracked, or by the formation of fissures. As the removal of the carbon is one of the practical difficulties connected with the working of clay retorts, it cannot but suggest itself that the plan which embraces the greatest saving of time, and produces the least injury to the retorts, is to be preferred. Should any more practicable and advantageous method be known than that which has just been described, it is desirable that it should be pointed out.

With respect to the difference in the quantity of fuel required for carbonizing the coal in iron and in clay retorts, the results of practice differ from the statements

made by the partizans of clay retorts. It has been found that where proper judgment and skill are exercised in the construction and working of clay retorts, the quantity of coke required for heating them in ordinary working, ranges from 25 to 30 per cent. of the quantity of coke made, assuming that Newcastle coal is used, and that a chaldron of coke is afforded by each ton of coal. Iron retorts may be treated with precisely the same results. In the case of short retorts, the clay retorts possess no economical advantages over those of iron of the same size, as far as the fuel of carbonization is concerned. But when long clay retorts are employed, say 20 feet in length, then a saving of fuel would be effected, as the same fuel required for heating two beds of iron retorts seven feet six inches long, placed end to end, would heat the clay retorts 20 feet long, thus giving five feet of additional length for each retort; that is to say, the brick-work partition required for the iron retorts being no longer necessary, enables the space it occupied to be added to each clay retort, and in this way the quantity of fuel for carbonization is reduced to a percentage varying from 19 to 24. It is to be understood that the usual time of working both the long and the short retorts is six hours for each charge of Newcastle coal.

It appears, then, that the principal advantages arising from the use of clay retorts are, that there is a saving of about 20 per cent. in the setting, compared with the expense of setting iron retorts, and that the average durability of clay retorts in work is two years and a half, whilst iron retorts of the best quality only last one year. It may be added, that the first cost of clay retorts does not amount to more than half that of iron retorts, which, of itself, forms a very important saving in this department of gas-engineering.

THE ELECTRIC LIGHT.

We have from time to time published accounts of various experiments with the electric light, where it was proposed to utilize it as an illuminating agent, either for lighthouses or other places. The following interesting paper we take from *Chamber's Edinburgh Journal*. It gives an instructive *resumé* of the subject from the date of the first experiments with it down to the present time:

"The snapping, sharp, decisive electric spark gives out an intense light, as almost every one knows; and it is now, in these lecture-days, pretty generally known also, that a flash of lightning is itself an electric spark on a gigantic scale. There is a current of something—people call it electricity, in the absence of any better name—rushing from one point in space to another; and if it meets with any obstacle to its free movement, this something heats the obstacle so suddenly and so intensely as to make it white hot, and therefore incandescent. Provided we do not tax it too closely, this brief explanation will suffice for the present purpose.

"Now, multitudes of ingenious men have been trying for years and years past, to make the electric spark sufficiently steady for the purposes of ordinary illumination. The difficulties in doing this are very great. Each spark endures for an almost inconceivably minute space of time; insomuch that a *continuous* light could result only from a succession of these sparks following each other at imperceptibly small intervals. Every contrivance that could be devised, until quite a recent period, failed in producing steadiness in this succession; the light was always flickering, irritating, and unsuitable for practical use. Many brains have been taxed fruitlessly in this search. About 17 years ago, two inventors, Messrs. Greener and Staite, patented an electric light, with which they intended to startle the world. They devised a mode of inclosing small lumps of pure carbon in air-tight vessels, and rendering them incandescent or luminous by currents of galvanic electricity. After many months of experiment, this new light was actually exhibited outside the National Gallery, the north tower of Hungerford Suspension Bridge (now doomed), the Duke of York's Column, and the Polytechnic Institution, in 1847; and there was quite enough to astonish the Londoners in the occasional flashes of intense light given forth. To produce this result, two small pointed pieces of carbon were so placed that their points should be a short distance apart; and as this distance slightly increased by the slow combustion of the carbon, so were the points brought again to their former distance by means of wheel-work. The two pieces of carbon lay directly in the path of a galvanic current, transmitted from one copper wire to another; and in the act of leaping over the small space from the one bit of carbon to the other, the current heated both of them intensely, and made them give forth a dazzling white light. But these ingenious inventors, notwithstanding all their praiseworthy endeavors, could not obtain a steady light; it *would* flicker and intermit, and failed to become practically useful, although they fondly hoped—as they declared—that streets and buildings might thus be lighted at one-sixth of the cost of gas.

"Then came MM. Achereau and Foucalt's display of electric lightning at Paris, in 1848; and M. Le Molt's patented mode of arranging the carbon-points; and other patented improvements by Mr. Gillespie, Mr. Pearce, Mr. King, and others. Mr. Grove, in a lecture at the Royal Institution in 1849, stated that so far back as 1843, he had illuminated the lecture-room at the London Institution with the electric light; but Dr. Faraday, and all the scientific men about that time (1849), acknowledged the fitful nature of the light, and its unsuitableness for general purposes, whatever might be the case with special uses. In the following year, Mr. Allman tried to devise a mode by which the distance between the carbon-points should vary, according to the intensity of the electric current, so that the one quantity, compensating the other, might produce an equality in the light; but this required apparatus too delicately adjusted for such works. Next came Mr. Paine's electric water-light—a project which drove the American newspapers almost wild with delight, and absorbed a great many notes of admiration in the printing. The inventor was credited with much more than the introduction of a substitute for candles and gas. A Boston newspaper asserted not only 'that he had extorted from nature the secret of the artificial production of light at a nominal cost, but that he has got hold of the key which unlocks, and enables him to command, a new force of nature, which is soon to supersede most of the forces now employed—something which is destined to work a revolution both in science and art.' Experience has not realized this brilliant anticipation. Mr. Paine's apparatus consisted of a glass jar containing spirits of turpentine, another glass jar containing water, two strips of copper, a small tube which terminated in a jet or burner, and an electro-galvanic machine. When the machine was worked, water was decomposed, bubbles of gas escaped from the jar, these bubbles passed through spirits of turpentine, and a brilliant light was produced by ignition. A battle of the chemists ensued. Mr. Paine asserted that the customary theory about oxygen, hydrogen and water, is incorrect; and that the truth, as he had developed it, would supply us with a source of light far cheaper than any before known. These views were stoutly combatted by those who held to the more usual opinions. Mr. Paine's plan, whatever may have been his theoretical views, did not come successfully into practice. About the same time, M. Nollet obtained an English patent for another plan, in which water was to play a great part. Water was to be decomposed by galvanism; the liberated hydrogen was to take up a dose of carbon from another agent; the carburetted hydrogen thus produced was to yield a brilliant light, and at the same time such an amount of heat as would constitute an economic substitute for coal in boiler-furnaces. This, like Mr. Paine's plan, failed to come into effective use.

"It will thus be seen that many modes have been attempted for giving the electric light a kind and degree of steadiness suitable for practical purposes; and if we follow the history of the subject within the last few years, we shall find other indications of analogous character. In two instances, at least, the electric light has been made available for engineering operations. In one these cases the light was employed at the works of the new Westminster bridge (now finished.) When the foundations were being laid in 1858, much of the work could be done only at low-water, and it thence became desirable to continue the operations by night as well as by day, when the tide suited. To effect this, an electric light, equal in intesity to 72 argand jets, was produced on shore by means of an electro-galvanic apparatus. The light was about 200 feet distant from a stage or platform on which a number of men were employed in pile-driving, and was augmented by the use of a pair of Chappin's reflectors. The light was rather flickering, but was sufficient for the purpose, being likened by the men to that of the full moon. In another instance, in France, the electric light was employed to give light to the workmen employed at night in excavating the stupendous docks at Cherbourg, which have excited so much attention. Two sets of apparatus were used, each maintained by one of Bunsen's large batteries of 50 pair of plates. The light was of intensity enough for the requirements of eight hundred men.

"In 1862, MM. Dumas and Benoit suggested the employment of the electric light for mining purposes. A galvanic battery, a Ruhmkorff's coil, and a Geissler's tube—three forms of apparatus well-known to electricians, but rather too complicated to be described here—are used. The light produced by those agencies does not heat the tube that contains it; it is isolated and distinct, so that no gas in the mine can gain access to it; it is as compact as an ordinary mining lamp; it will work twelve hours, with only an occasional movement of the carbon with a rod; and the miner can easily carry it about with him in a small carpet-bag. About the same time, M. Serrin succeeded in making the electric light burn under water, thereby placing at the disposal of the hydraulic engineer a source of light likely to be very valuable in various constructive works relating to piers, sea-walls, sunken rocks, sunken wrecks; and to the shipwrights, an aid in examining the bottoms of ships needing repair.

"In another direction, inventors have sought for modes of illuminating buildings and open public places. Mr. Gassiot, in 1860, communicated to the Royal Society the *rationale* of a beautiful contrivance for throwing a brilliant light into a room. A glass carbonic-acid tube, one-sixteenth of an inch in diameter, is coiled round into a kind of flat spiral; the two ends, considerably widened, are bent downwards nearly side by side, and inclosed in a small wooden box; platinum slips, connected with a Ruhmkorff's coil, enter these two widened ends; and when a current is generated, the whole spiral becomes brilliantly illuminated.

"Concerning the lighting of the fronts of buildings, Dr. Phipson, in his recent work on *Phosphorescence*, has brought forward a curious speculation. He states that when houses are freshly whitewashed—that is, coated with lime-wash—and when the sun has been shining brightly on them during the day, a faint phosphorescent light is visible on them at night; and he suggests that, by employing sulphide of calcium or sulphide of barium, the phosphorescenee might possibly be strong enough to serve as a substitute for artificial light. However, this is a matter connected with the theory of phosphorescence, rather than with that of the electric light.

"In the summer of 1861, the electric light was employed to illuminate the Cour du Carrousel and the Cour du Palais Royal at Paris. On these occasions, magneto-electric machines were used instead of electro-galvanic machines. In one of the experiments, the machines placed in one of the lower rooms of the Tuileries were worked by a four-horse-power steam-engine. When the horse-shoe magnets had attained a revolution of 60 turns per minute, communication was opened with two copper wires, each 300 metres in length, and a light was produced equal in intensity to that of 150 carcel lamps. In another experiment, the whole of the court of the Palais Royal, and the two entrances of the Rue St. Honoré, were lighted up almost as with the light of a full moon. The distance asunder of the carbon-points was, in these instances, maintained by an ingenious apparatus invented by M. Serrin, and called by him the 'Automatic Regulator.' In this apparatus, which the inventor described at the Oxford meeting of the British Association in 1860, the two carbon-points are placed one above another, and a wheel and a pendulum are so combined as to keep the carbon-points always at a uniform distance, notwithstanding the gradual burning away of the substance. At a soirée at the Polytechnic Institution some time ago, M. Serrin's apparatus was employed under very pleasing and attractive circumstances; for the brilliant electric light transmitted through ground glass globes, and through Messrs. Defrie's glass prisms, became at once beautiful

in tint and bearable in intensity. In one of the experiments at Paris, M. Dubosq displayed an electric light in a great hall where a thousand persons were assembled at a literary soirée; the light was strong enough to read ordinary type at a distance of 100 feet from the apparatus. Other experiments of an analogous character have been made in Paris and in London.

"It is not to be wondered at that the problem concerning the applicability of the electric light to *light-house* purposes should have engaged much attention on the part of scientific and practical men, seeing that the light required must necessarily be very intense, in order to penetrate to a great distance, and to overcome to some extent even the resisting medium of fog or mist. Burning coal, tar and other rough substances, were superseded by lamps and candles of various kinds; and then were devised numerous arrangements of focalizing apparatus, to concentrate the rays chiefly in one direction, by reflection from bright concave metallic surfaces, or by refraction through glass lenses. The lime-light or Drummond light, produced by the action of oxyhydrogen on lime, has also been occasionally employed, but not to any great extent, owing to difficulties connected with the management of the gas. There have also been obstructions of a sufficiently discouraging kind in the attempts to apply the electric light as a substitute for these earlier contrivances. Nevertheless, the difficulties are gradually disappearing. In January of the present year, Capt. Bolton telegraphed during a hazy night from Portsmouth to Bembridge, in the Isle of Wight, a distance of thirteen miles; he used the lime-light, with a modification of Morse's telegraphic alphabet. The success was such as to show that, with the electric light instead of the lime-light, this method might be peculiarly valuable in time of war.

"As concerns regular light-house illumination, however, we must go back to the year 1857, when the Trinity House, as the official authority in these matters, caused experiments to be made on the subject. They were conducted first by Dr. Faraday and Prof. Holmes; then the latter was desired to frame a practical system; and, finally, this system had the benefit of Dr. Faraday's approval and suggestions. The chief feature in these labors was the substitution of the magneto-electric machine for the galvanic; that is, the production of a current and a spark by magnetic instead of galvanic action. At the end of December, 1858, matters were so far advanced as to permit of an electric light being tried at the South-Foreland light-house, in Kent; but as the apparatus was imperfect in some particulars, and the results unsatisfactory, the lighting was suspended for a while, to admit of further improvements. In March, 1859, the apparatus was again set up, and Dr. Faraday made a report to the Trinity House in reference to it. The important part of the report was, an expression of the learned philosopher's opinion that Professor Holmes had practically established the fitness and sufficiency of the magneto-electric light for light-house purposes, so far as its nature and management are concerned. The light produced was powerful beyond any other that he had seen so applied; its regularity in the lantern was great, and its management was easy. Early in 1860, Dr. Faraday again visited the light-house, and found that the electric light was doing its duty bravely, *so long as it shone*. There was, however, one circumstance that caused anxiety to the light-keeper: the light now and then had a tendency to go out, either owing to the breaking off of the end of the bits of carbon, or to some disarrangement of the fine mechanical work of the lamp. It is true that the slightest touch by the light-keeper brought the carbon points into the proper position again; but it was certainly a serious matter, for it required the keeper to be constantly on the watch, instead of regarding the apparatus as automatic or self-regulating.

"Nevertheless, in a paper read by Dr. Faraday before the Royal Institution, on the 9th of March, 1860, he spoke in warm praise of Professor Holmes's apparatus. The power was produced by several magnets set into rapid revolution, inducing an electric current in helical coils of copper wire; and this current was made to produce light at and between two carbon-points. 'There are two magneto-electric machines at the South-Foreland,' said Dr. Faraday, 'each being put in motion by a two-horse power steam-engine; and excepting wear and tear, the whole consumption of material to produce the light is that which is required to raise steam for the engines, and carbon-points in the lantern.' This is certainly a wonderful example of what now-a-days is called the corrolation or convertibility of forces: 'a lucifer match kindles paper and wood; these kindle coke or coal; the heat thence produced makes water boil; the boiling water becomes converted into steam; the pressure of this steam moves a piston; the piston moves a fly-wheel; the rotating fly-wheel causes a series of magnets to rotate; this magnet rotation induces an electric current through a copper wire; this current intensely heats two bits of carbon at their point of separation; and the heated carbon gives forth an intensely brilliant light—and so we mount upward from the lucifer-match to the electric light, by an unbroken chain of causes and effects.' Dr. Faraday went on to state: 'The lamp is a delicate arrangement of machinery, holding the two carbons between which the electric light exists, and regulating their adjustment; so that whilst they gradually consume away, the place of the light shall not be altered. The electric wires end in the two bars of a small railway, and upon these the lamp stands. When the carbons of a lamp are nearly gone, that lamp is lifted off, and another instantly pushed into its place. The machines and lamp have done their duty during the past six months in a real and practical manner. The light has never gone out through any deficiency or cause in the engine or machine-house; and when it has become extinguished in the lantern, a single touch of the keeper's hand has set it shining as bright as ever. The light shone up and down the channel, and across into France, with a power far surpassing that of any other fixed light within sight, or anywhere existent. The experiment has been a good one.'

"Dr. Faraday felt himself justified in recommending to Trinity House, in 1860, a further trial of this excellent invention. They acceded to his views, and after a time established an electric light at the Dungeness light-house. The electric apparatus was nearly the same, but the optical accessories were more complete than at the South-Foreland, so as to focalize the rays in a more practically useful manner. By a judicious arrangement, the old oil-lamp and reflectors were retained without disturbance, that they might be used again if the electric light went wrong, or both might be used together in very foggy weather. Some careful experiments showed, however, that so overwhelming is the intensity of the electric light, compared with any form of oil lamp, that the latter scarcely adds anything to the brilliancy of the light produced by the former; this is especially the case at very long distances, showing the penetrating nature of the electric light. During 1860, 1861 and 1862, Dr. Faraday made multiplied experiments and observations on the Dungeness light. He gradually arrived at these conclusions in favor of the *oil*-light system, as compared with the *electric*: that it is more simple to manage; that it requires only two keepers alternately in a light-house, whereas the electric system requires men who understand the management and repair of steam-engines, as well as lamps, and their watchful adjustment; that the failure of the light is less probable, on account of the greater simplicity of the apparatus; and lastly, that the expense of the oil system is less than that of the electric system. On the other hand, the all-powerful intensity of the light is, in Dr. Faraday's opinion, far more than equivalent for the advantages on the other side.

"In conclusion, there seems every justification for expecting that the still remaining difficulties will one by one be conquered, and that we shall see the electric light adopted extensively for light-house purposes. A light that renders England and France visible to each other in the middle of the night, and that, as is asserted, enables print to be read at a distance little less than ten miles, is surely a light that will triumph over all petty obstacles. The fitful results of the electric light at the recent public illumination on the 10th of March, were no proof to the contrary; they only showed that incomplete arrangements naturally produce incomplete action."

SELMA, ALA.—The gas-works at this place are closed, and the town is in total darkness, the engineer having been caught in the meshes of Jeff. Davis' conscription act.

ON THE MOLECULAR MOBILITY OF GASES.

BY THOMAS GRAHAM, F. R. S.

(*Concluded from page* 107.)

Interdiffusion of Gases.—Double Diffusion.—The diffusiometer was much improved in construction by Prof. Bunsen, from the application of a lever arrangement to raise and depress the tube in the mercurial trough. But the mass of stucco forming the porous plate in his instrument was too voluminous, in my opinion, and, from being dried by heat, had probably detached itself from the walls of the glass tube. The result obtained of 3.4 for hydrogen, air being 1, is, I understand, no longer insisted upon by that illustrious physicist. It is indeed curious that my old experiments generally rather exceeded than fell short of the theoretical number for hydrogen:

$$\sqrt{\frac{1}{0.06926}} = 3.7997.$$

With stucco as the material, the cavities in the porous plate form about one-fourth of its bulk, and affect sensibly the ratio in question, according as they are or are not included in the capacity of the instrument. Beginning the diffusion always with these cavities filled with hydrogen, the numbers now obtain with a stucco plate of 12 millimetres in thickness, dried without heat, were 3.783, 3.8, and 3.739 when the volume of the cavities of stucco is added to the air and hydrogen, and 3.931, 3.949, and 3.883 when such addition is not made to these volumes. The graphite plate, on the other hand, being thin, and the volume of its pores too minute to require to be taken into account, its action is not attended with the same uncertainty. With a graphite plate of 2 millimetres in thickness, the number for hydrogen into air was 3.876, and of hydrogen into oxygen 4.124, instead of 4. With a graphite of 1 millimetre in thickness, hydrogen gave 3.993 to air 1. With a graphite plate of 0.5 millimetre in thickness, the proportional number for hydrogen to air rose to 3·984, 4.068, and 4.067. A similar departure from the theoretical number was observed when hydrogen was diffused into oxygen or carbonic acid, instead of air. All these experiments were made over mercury and with dried gases. It appears that the numbers are most in accordance with theory when the graphite plate is thick, and the diffusion slow in consequence. If the diffusion be very rapid, as it is with the plates, something like a current is possibly formed in the channels of the graphite, taking the direction of the hydrogen and carrying back in mass a little air, or the slower gas, whatever it may be. I cannot account otherwise for the slight predominance which the lighter and faster gas appears always to acquire in diffusing through the porous septum.

Speculative Ideas respecting the Constitution of Matter.—It is conceivable that the various kinds of matter, now recognized as different elementary substances, may possess one and the same ultimate or atomic molecule existing in different conditions of movement. The essential unity of matter is an hypothesis in harmony with the equal action of gravity upon all bodies. We know the anxiety with which this point was investigated by Newton, and the care he took to ascertain that every kind of substance, "metals, stones, woods, grain, salts, animal substances," &c., are similarly accelerated in falling, and are therefore equally heavy.

In the condition of gas, matter is deprived of numerous and varying properties with which it appears invested when in the form of a liquid or solid. The gas exhibits only a few grand and simple features. These again may all be dependent upon atomic and molecular mobility. Let us imagine one kind of substance only to exist, ponderable matter; and further, that matter is divisible into ultimate atoms, uniform in size and weight. We shall have one substance and a common atom. With the atom at rest the uniformity of matter would be perfect. But the atom possesses always more or less motion, due, it must be assumed, to a primordial impulse. This motion gives rise to volume. The more rapid the movement the greater the space occupied by the atom, somewhat as the orbit of a planet widens with the degree of projectile velocity. Matter is thus made to differ only in being lighter or denser matter. The specific motion of an atom being inalienable, light matter is no longer convertible into heavy matter. In short, matter of different density

forms different substances—different inconvertible elements as they have been considered.

What has already been said is not meant to apply to the gaseous volumes which we have occasion to measure and practically deal with, but to a lower order of molecules or atoms. The combining atoms hitherto spoken of are therefore not the molecules of which the movement is sensibly affected by heat, with gaseous expansion as the result. The gaseous molecule must itself be viewed as composed of a group or system of the preceding inferior atoms, following, as a unit, laws similar to those which regulate its constituent atoms. We have indeed carried one step backward and applied to the lower order of atoms ideas suggested by the gaseous molecule, as views derived from the solar system are extended to the subordinate system of a planet and its satellites. The advance of science may further require an indefinite repetition of such steps of molecular division. The gaseous molecule is then a reproduction of the inferior atom on a higher scale. The molecule or system is reached which is affected by heat, the diffusive molecule, of which the movement is the subject of observation and measurement. The diffusive molecules are also to be supposed uniform in weight, but to vary in velocity of movement, in correspondence with their constituent atoms. Accordingly the molecular volumes of different elementary substances have the same relation to each other as the subordinate atomic volumes of the same substances.

But further, these more and less mobile or light and heavy forms of matter have a singular relation connected with equality of volume. Equal volumes of two of them can coalesce together, unite their movement, and form a new atomic group, retaining the whole, the half, or some simple proportion of the original movement and consequent volume. This is chemical combination. It is directly an affair of volume, and only indirectly connected with weight. Combining weights are different, because the densities, atomic and molecular, are different. The volume of combination is uniform, but the fluids measured vary in density. This fixed combining measure—the *metron* of simple substances—weighs 1 for hydrogen, 16 for oxygen, and so on with the other "elements."

To the preceding statements respecting atomic and molecular mobility, it remains to be added that the hypothesis admits of another expression. As in the theory of light we have the alternative hypothesis of emission and undulation, so in molecular mobility the motion may be assumed to reside either in separate atoms and molecules, or in a fluid medium caused to undulate. A special rate of vibration or pulsation originally imparted to a portion of the fluid medium enlivens that portion of matter with an individual existence, and constitutes it a distinct substance or element.

With respect to the different states of gas, liquid, and solid, it may be observed that there is no real incompatibility with each other in these physical conditions. They are often found together in the same substance. The liquid and the solid conditions supervene upon the gaseous condition rather than supersede it. Gay-Lussac made the remarkable observation that the vapors emitted by ice and water, both at 0° C., are of exactly equal tension. The passage from the liquid to the solid state is not made apparent in the volatility of water. The liquid and solid conditions do not appear as the extinction or suppression of the gaseous condition, but something superadded to that condition. The three conditions (or constitutions) probably always co-exist in every liquid or solid substance, but one predominates over the others. In the general properties of matter we have indeed, to include still further (1) the remarkable loss of elasticity in vapors under great pressure, which is distinguished by Mr. Faraday as the Caignard-Latour state, after the name of its discoverer, and is now undergoing an investigation by Dr. Andrews, which may be expected to throw much light upon its nature; (2) the colloidal condition or constitution, which intervenes between the liquid and crystalline states, extending into both and affecting probably all kinds of solid and liquid matter in a greater or less degree. The predominance of a certain physical state in a substance appears to be a distinction of a kind with those distinctions recognised in natural history as being produced in unequal development. Liquefaction or solidification may therefore not involve the suppression of either the atomic or the molecular movement, but only the restriction of its range. The hypothesis of atomic movement has been elsewhere assumed, irrespective of the gaseous condition, and is applied by Dr. Williamson to the elucidation of a remarkable class of chemical reactions which have their seat in a mixed liquid.

Lastly, molecular or diffusive mobility has an obvious bearing upon the communication of heat to gases by contact with liquid or solid surfaces. The impact of the gaseous molecule, upon a surface possessing a different temperature, appears to be the condition for the transference of heat, or the heat movement, from one to the other. The more rapid the molecular movement of the gas the more frequent the contact, with consequent communication of heat. Hence, probably, the great cooling power of hydrogen gas as compared with air or oxygen. The gases named have the same specific heat for equal volumes; but a hot object placed in hydrogen is really *touched* 3.8 times more frequently than it would be if placed in air, and four times more frequently than it would be if placed in an atmosphere of oxygen gas. Dalton had already ascribed this peculiarity of hydrogen to the high "mobility" of that gas. The same molecular property of hydrogen recommends the application of that gas in the air-engine, where the object is to alternately heat and cool a confined volume of gas with rapidity.

PETROLEUM ITEMS.

Petroleum in Gaspe.—It has long been known that there were indications of mineral oil in Gaspe. Indeed, Sir Wm. Logan described these indications in his geological reports twenty years ago, long before the value of coal-oil was known. After the discoveries of oil in Pennsylvania and Enniskillen, the attention of some enterprising gentlemen was drawn to these reports, and a company has been boring for oil for some time near Gaspe Basin. We have now the important intelligence to communicate that oil has been struck at a depth of 560 feet. The oil is of a pale greenish brown color, and, even in its crude state, less offensive than some of the refined oil of Enniskillen. The well is said to be a flowing one, but no particulars are given. The limestone rock which produces this oil is found under conditions similar to that of Pennsylvania, and is three or four times the thickness of that of Enniskillen. The oil in this latter place has been flowing for many centuries, and man has only struck as it were, the remainder; whereas, the oil at Gaspe seems to have been more securely confined to its beds, as the stratum in which it is found scarcely crops out anywhere.—*Montreal Witness.*

Important to Shippers of Petroleum.—Mr. H. Coulter, who has had much experience in the petroleum trade, gives the following advice relative to shipments of the oil:

"Petroleum for export should be put in casks of the very best quality, and if painted well would be less liable to leak. The charges on importing this article are very large, but it is to be hoped that a considerable reduction will be made in the freight, which now averages 7s. 6. per bbl. from New York and Philadelphia. Insurance is also very heavy, being from six to eight per cent., including war risks, in American ships. It must be recollected that a reduction of one-sixth is to be made from the American gallon to reduce it to an English or imperial gallon; thus a barrel usually contains forty gallons, which is equivalent to 33 1-3 English, or 42 American gallons is just 35 gallons. The expense on refined oil is based upon the price of 2s. per gallon if sold from the quay, which is the least expensive mode, which will amount to 6½d. per English gallon. This includes the following charges: The 2½ per cent. cash discount, freight, insurance, town and dock dues, gauging and commissions. The crude oil is sold by the tun of imperial gallons, equivalent to 302 gallons, but as six per cent. is usually allowed for leakage and waste, 320 American gallons, or eight barrels, are commonly reckoned to a tun. The per centage of expenses is heavier on crude than on refined oil, as the freight, town and dock dues, porterage, &c., are as much on each barrel of crude as on refined. The expense on a tun of crude based on the present price of £17, if sold from the quay, including the 2½ per cent. cash discount, freight and other charges, as in the preceding example, would be £5 12s. 6d. If shippers would be careful to see that there was no water or sediment in the barrels, it would save the six per cent. usually charged for the purpose, which, in connection with a reduction in freight, (which is much needed,) would make the expenses much lighter."

Petroleum Refineries in Cleveland, Ohio.—The Cleveland *Herald* says that there are sixteen petroleum refineries in the vicinity of that city, in which 103,691 gallons of the refined oil were produced during the month of August last, of which 23,709 gallons were for exportation. This does not include the heavy lubricating oil and the naphtha also obtained from the crude petroleum. There are 39 refining stills in operation in these refineries; the petroleum is obtnined from the wells in Pennsylvania, costs from $6 to $7 per barrel of 40 gallons at the wells, and yields about 80 per cent. of pure illuminating fluid, besides some naphtha and heavy oil. Some tar is also produced. Before the oil can be sold, it has to be inspected twice—once for quality and once for quantity. The average price for it at Cleveland is 65 cents per gallon. There are new works going up every day in almost all parts of the city, and the capacity for refining will be increased from 25 to 50 per cent. during the present year.

Tank Petroleum Ships.—The tank-ship *Jane* lately arrived in the Mersey from Philadelphia, with a cargo of crude petroleum oil, in bulk, belonging to the Liverpool and Ramsey Oil Refining and Chemical Works Company. This is the first iron-tanked vessel with petroleum oil that has arrived in Liverpool. The *Jane* was specially constructed for conveying oil from America to the company's works at Ramsey, where it is discharged into hermetically sealed floating tanks which are moored in the river, thus preventing the smell and waste from leakage so much complained of. The vessel made the passage in 24 days.

Freaks of the Oil Wells.—On the Story farm, some five miles from this place, there are five wells, all within a space of about five acres, viz.: The Ladies' Well, which formerly produced 300 barrels per day; the Echoltz, 350; Dalzell & Ewing, 500 barrels; the Columbia Oil Co.'s well, and Richie, Goe & Co.'s well. These two latter are new wells, and have never flowed much oil. All these wells are evidently connected with each other, for upon pumping one, all the rest will pump oil. The Columbia Co.'s well appears to be the key to the whole of these. Upon removing the tubing from it all the rest were stopped, and have been for some time past. Numerous have been the efforts made by the different wells to test their individual capacity, but, as they are all separate interests, some one of the number would pull up their tubing as soon as the others commenced to work. For several weeks past all the parties have been stripped and ready for the fight. When one well commenced operations all the rest did likewise. The one failing to get oil as soon as he wished, would pull up the tubing and stop the rest. This state of affairs continues up to the present date, and it is what we should consider expensive amusement, as they have to watch each other all the time. Would it not be better for all parties to compromise the matter some way, as the locality where these wells are is on the best producing territory on the Creek?—*Oil City Register.*

Wicks for Kerosene Oil Lamps.—One of the most frequent causes of the bad burning of mineral-oil lamps arises from the employment of damp wicks. Cotton, like most other vegetable fabrics, readily absorbs from one-sixth to one-fifth of its weight of moisture from the atmosphere; this prevents the free ascent of the oil, and leads to charring of the wick, and the production of an imperfect flame—hence, it is exceedingly important that a new wick should be thoroughly dried before it is placed in the lamp. When it has been once saturated with oil, the further absorption of moisture is prevented. If our subscribers would point out this small precaution to their customers, both parties would find it of advantage. The trouble of holding a wick before the fire till it ceases to give out any vapor is so trifling as not to be taken into consideration, and the improvement in the flame and the regularity of burning is considerable.

PATENTS.

UNITED STATES.

39,834.—James Platt, Utica, N. Y., for a Water-Wheel. Antedated July 20, 1862:

I claim the arrangement of the pivoted buckets, H H, recesses, m m, and segment, G, with the wheel, C, hubs, 4 g, arms, f, and inclined sector chute, D, all in the manner herein shown and described.

39,842.—Nathan Stedman, Aurora, Ind., for a Pump:

I claim the hollow piston, B, provided with the hollow valve, H, and tubular rod, C, in combination with the water-passages, D E F, and double puppet valve, G, all arranged to operate as and for the purpose herein set forth.

39,852.—William Watts, Newark, N. J., for a Steam-Pump:

I claim, first, The combination of the projection or bearing, P, with the wedge, W, bolt, B, and cap, C, substantially in the manner and for the purposes described.

Second, I claim the combination of the said wedge, W, with the valve, V, substantially in the manner and for the purposes described.

39,856.—Anna C. Wilhelm, Philadelphia, Pa., for a Burner for Coal-Oil Lamps. Antedated May 13, 1863:

I claim surrounding the wick-tube, B, with a tapering jacket, A, fitting closely around the upper orifice of the said tube, substantially in the manner described and set forth, for the purposes specified.

I also claim in combination with the said jacket, A, the two projecting guards, a2 a2, the same being constructed and arranged substantially as set forth, for the purposes specified.

39,904.—Joseph S. Elliott, Philadelphia, Pa., for a Gas-Meter:

I claim producing the stop motions in the registers of gas-meters by means of the levers B, or their equivalents, arranged to operate in combination with the recesses and teeth of the wheels, A, substantially in the manner described and set forth for the purpose specified.

39,905.—William Elmer, New York city, for the Manufacture of Illuminating Gas:

I claim the combination of the following devices or their equivalents, viz.:

First, A retort in which water is decomposed to furnish hydrogen.

Second, A retort in which a fluid hydro-carbon is decomposed by heat.

Third, One or more furnaces for heating the retorts to the required temperature.

Fourth, Apparatus for suppiying water in regulated quantities to the retort in the manner in which it is decomposed.

Fifth, Apparatus to supply a fluid hydro-carbon in regulated quantities to the retort in which it is decomposed.

Sixth, A connection to conduct the hydrogen from the place where it is formed to the hydro-carbon retort; the combination as a whole constituting an apparatus for manufacturing illuminating gas, and operating substantially as set forth.

Seventh, I also claim the combination of the hydrogen retort with the hydro-carbon retort through the intervention of a condenser, substantially as set forth.

Eighth, I also claim the combination of the boiler for generating steam with the hydrogen retort, through the intervention of a heating apparatus, substantially as set forth.

Ninth, I also claim the combination of the hydrogen retort with the hydro-carbon retort, through the intervention of a heating apparatus, substantially as set forth.

39,907.—Joseph E. Fisk, Salem, Mass., for a Dry Gas-Meter. Antedated Feb. 13, 1863:

I claim, first, The combination of a rotary crank or eccentric and guides and stops K K M M O, substantially as and for the purpose set forth.

Second, The arrangement of the chambered valve which is operated with an eccentric motion and controlled by a cross or its equivalent, as described in said motion, in combination with the gas ports arranged on opposite sides of the seat and around a central discharge passage in the manner and for the purposes herein described.

39,918.—G. B. Hill, New York city, for a Means of using Hydro-Carbon oil as Fuel:

I claim, first, The employment or use of a mixture of hydro-carbon liquid with steam as fuel in furnaces, &c., substantially as herein specified.

Second, The mixer, a, and pipes, b b', in combination with the vessel, a', and radiating pipes, B, constructed and operating in the manner and for the purpose shown and described.

39,945.—Charles Monson, New Haven, Conn., for a Bracket for Lamp or Gas-Light. Antedated July 4, 1862:

I claim the use of the parallel tubes, as A and B, in combination with Z-shaped tubes, as C, Fig. 2, or tubes of any analagous form, so as to use insertion conduit joints when the whole is constructed, arranged, and fitted for use substantially as herein described.

Second, I claim the use of the rack, a, and ratchet or click, b, for sustaining the light at the desired elevation, in combination with the parallelogram substantially as set forth

39,974.—W. W. Virdin, Baltimore, Md., for a Pump:

I claim, first, The intermediate moving valved chamber, B, constructed, arranged, and operating substantially as described, in combination with the stationary valved chamber, E, and the valved receiving, outer, stationary chamber, A, all adapted to the end stated, and substantially as specified.

Second, The outer stationary valved cylinder, A, stationary inner mast, discharging cylinder, E, in combination with the intermediate-valved cylinder, B, and connecting arms, C C, the latter passing directly through the central plate, G, and cap plate, D, the whole constructed and operating substantially as described.

Third, The manner of securing the three-valved cylinders, A and E, together at their upper ends, viz., by means of the flanges, a f, and plate, G, substantially as described.

39,978.—J. W. Wetmore, Erie, Pa., for an Apparatus for Condensing Oil Vapor:

I claim, first, The separate upward-flowing currents above and below the vapor-chamber.

Second, The propulsion of these currents on the principle of the siphon.

Third, The corrugation of the upper condensing surface.

Fourth, The breaks of wooden angles or doors in the vapor chamber.

Fifth, The sprinkler, v, figure 4, all substantially as set forth for the purposes specified.

40,006.—C. C. Alexander, Denver, Colorado, for a Pump:

I claim the peculiar arrangement of the cylinder to a reservoir by means of the pipes fastened to a cylinder-head and to a check-valve seat, substantially as hereinbefore described.

40,008.—C. L. Adancourt, Troy, N. Y., for a Rotary Pump:

I claim the arrangement of the packing pieces, C and H, with rounded stems to fit into sockets, b or j, substantially in the manner and for the purpose herein described.

I also claim the combination of the grooved flanges, d, with the sliders, F, and piston, D, substantially as and for the purpose described.

40,044.—Jacob Jahraus, Buffalo, N. Y., for a Faucet and Vent:

I claim the compound discharge nozzle composed of the cylinders, G and H, in combination with the hollow valve piston, K, (with or without the holes K'), valve-stem, C, and valve, c1 c2, and lever, E, arranged and operating for the purposes and substantially as described.

I also claim the valve, P, arranged and operating upon the outside of the ventilating plug, M', substantially as set forth.

40,046.—W. D. Jones, Hagaman's Mills, N. Y., for a Water Elevator:

I claim the peculiar arrangement of the several parts of the described friction clutch and crank combined, in combination with the pawl, g, shaft, a, and crank, handle, or lever, d, constructed and operating substantially as and for the purposes shown and described.

40,057.—William Mullins, Steubenville, Ohio, for a Lantern:

I claim surmounting the oil-cup with a hot-air chamber, and supplying heat thereto by means of the bent tube, D, passing over the flame of the lamp from a point below the bottom of the oil-cup, and discharging into the air-chamber in the manner and for the purpose specified.

PATENT AGENCIES.

SCIENTIFIC AMERICAN OFFICE,
NEW YORK CITY—37 PARK ROW,
WASHINGTON, D. C.—F AND 7TH STS.

MESSRS. MUNN & CO., publishers of the SCIENTIFIC AMERICAN and Patent Solicitors for the last seventeen years, would announce to the public that they never possessed better facilities for obtaining Letters Patent and transacting all kinds of business before the Patent Office than they now have.

During the *seventeen years* they have been engaged in procuring patents they have acted as Attorneys for more than SEVENTEEN THOUSAND patentees. Nearly one-third of all the applications for patents annually made in this country are conducted through the "Scientific American Patent Agency," and nearly all the patents secured abroad by American citizens are taken through this Office.

In making an application for a patent, all the inventor is required to do is to furnish a model with an explanation of the operation and advantages claimed. The drawings, petition, specification and other papers are prepared and presented at the Patent Office by MUNN & Co., who have a large corps of engineers, draughtsmen, specification writers and copyists in constant employment. Papers prepared at short notice.

Pamphlets of instruction, announcing the amount of fees, size of model, and other information as to the best mode of obtaining patents in this and all foreign countries, are furnished free on application. For further particulars address

MUNN & CO.,
PUBLISHERS OF THE "SCIENTIFIC AMERICAN,"
No. 37 Park Row, New York.

ESTABLISHED 17 YEARS.

OFFICE FOR THE PROCURATION of Letters Patent and the Registration of Designs. JOSEPH WILLCOCK & CO., Patent Agents and Engineers, successors to Messrs. BARLOW & Co., 89 Chancery Lane, London, W. C.

Gratis and post free, "The Inventor's Manual," also a pamphlet, "L'Obtention de Patentes Anglaises," 500 Mechanical Movements; the first part of Kinematics, or the Transformation of Motion, by Joseph Willcock, C. E., Mem. Soc. of Eng. May be had at the above address, and of any bookseller. Price 2s. 6d.

The second part is approaching completion and will shortly be announced.

AMERICAN AND FOREIGN PATENT AGENCY, Established 1838. Letters Patent for New Inventions procured in the United States, Great Britain, France, and other countries. LEMUEL W. SERRELL,
119 & 121 NASSAU ST., New York.

J. N. McINTIRE, PATENT ATTORNEY and SOLICITOR OF AMERICAN AND FOREIGN PATENTS,
Office, No. 37 PARK ROW, New York City.

F. C. TREADWELL, JUNR., SOLICITOR OF PATENTS,
And expert in Patent Cases, 335 BROADWAY, (Moffat's Building.) New York.

PATENT AGENCIES.

MESSRS. J. WRIGHT & CO., CONSULTING ENGINEERS and SOLICITORS of PATENTS, No. 42 Bridge street, Blackfriars, London, E. C. Patents for inventions obtained in all countries where Patent Laws are in force.

GAS-FIXTURES.

Mitchell, Vance & Co.,
MANUFACTURERS OF
CHANDELIERS,
And every description of
GAS FIXTURES,
WAREHOUSE, No. 620 BROADWAY.
MANUFACTORY,
Nos. 335, 337, 339, 343 WEST 24TH STREET,
New York.

GEORGE H. KITCHEN & CO.,
Manufacturers of
Fixtures for Gas-Light Purposes,
Wood's Building, No. 561 Broadway, New York.
Office of the Inspector of Gas Meters for the State of New York.

BOOKS FOR GAS ENGINEERS.

A TREATISE ON GAS-WORKS AND THE PRACTICE OF MANUFACTURING AND DISTRIBUTING COAL-GAS. By Samuel Hughes, Civil Engineer.

REPORT OF THE PROCEEDINGS OF BOTH HOUSES OF PARLIAMENT ON THE METROPOLITAN GAS BILL.

THE CHEMISTRY OF GAS-LIGHTING. By Lewis Thompson, Consulting Chemist.

A few copies of the above books, invaluable to gas engineers, are for sale at the Rooms of the AMERICAN GAS-LIGHT JOURNAL, No. 39 Nassau st., New York City.

GAS LEGISLATION, being a copious INDEX TO THE METROPOLIS GAS ACT OF 1860. By Samuel Hughes, C. E.

Gas Engineers who may want any scientific books will be promptly supplied at publisher's prices, by sending their orders, accompanied by the money, to this office.

OFFICIAL.

THE COMMITTEE ON LAMPS and Gas of the Board of Councilmen, will meet EVERY WEDNESDAY at 1 o'clock P. M., until further notice, in room No. 15, City Hall, for the purpose of investigating all papers referred to them. All persons interested are respectfully requested to appear before the Committee without further notice.

ALEX. BRANDON,
JAMES MURRAY,
RICHARD O'BRIEN,
} Committee of Lamps and Gas.

THE COMMITTEE ON SEWERS of the Board of Aldermen will meet EVERY WEDNESDAY, at 2 o'clock P. M., in room No. 8, City Hall. Parties interested in any matter before the Committee will have an apportunity of being heard.

GEO. A. JEREMIAH,
TERENCE FARLEY,
CHARLES H. HALL,
Committee on Sewers.

GAS & WATER-METERS

JOSEPH LENNIG,
1615, 1617, and 1619 Francis St.,
Above Ridge Avenue, Philadelphia, Pa.,
MANUFACTURER OF
WET & DRY GAS METERS,
STATION, SHOW, & EXPERIMENTAL METERS,
Photometers, Pressure Registers, Indicators, and Gauges, Governors, Meter Provers, Centre Seals, Fluid Gauges, &c.
GAS APPARATUS
Of the most reliable and approved construction manufactured and on hand at the
UNION GAS METER WORKS.

H. R. WORTHINGTON'S
PATENT WATER-METER.
This Meter combines
ACCURACY, SIMPLICITY, and
REMARKABLE DURABILITY,
with such ease and certainty of motion, as to offer no appreciable obstructions to the flow of water in the pipes to which it is connected, as it runs and registers upon three inches head, or when delivering the smallest stream. These qualities, with its low cost, have caused its extensive adoption by corporations and individuals, in many of our largest cities.
HENRY R. WORTHINGTON,
61 Beekman street, N. Y.

STEAM-PUMPS.

WORTHINGTON'S STEAM PUMPS, extensively used by Gas-Light Companies. For Sale at greatly Reduced Prices.
Also, a new and highly successful Pump, driven by water pressure, requiring no attention or repairs, and the most economical water motor yet constructed.
Patent GATES, for Water and Steam-stops.
HENRY R. WORTHINGTON,
61 Beekman street, N. Y.

WEST'S IMPROVED PUMPS, the most Simple, Durable, and Powerful, and the Cheapest in use.
J. D. WEST & CO.,
179 BROADWAY, N. Y.

"NEW BOOKS." ANY OF OUR Readers who may require books on the subject of Gas-Light, Heat, Water, Sewerage, or other scientific matters, can be promptly supplied by addressing the Publisher of THE AMERICAN GAS-LIGHT JOURNAL, No. 58 Liberty st., New York.

FINANCIAL.

JOHN MOSS, Jr.,
BROKER,
83 WALL STREET, NEW YORK,
Particular attention given to the negotiation of GAS-LIGHT and WATER COMPANIES SHARES and BONDS.

ALBERT H. NICOLAY,
STOCK BROKER AND
AUCTIONEER,
No. 52 William Street,
NEAR WALL ST., NEW YORK.
Special attention given to the Buying and Selling of Gas-Light Companies' Stocks.

JOHN B. MURRAY,
No. 39 NASSAU STREET,
Opposite the Post Office, NEW YORK,
OFFERS FOR SALE
GAS-LIGHT STOCKS
In all the leading Companies.

D. PARRISH, Jr.,
GAS ENGINEER
And Contractor for Coal or Oil Gas-Works.
Estimates given for Gas-Works, Gas-Holders, or any Gas Apparatus.
To Manufacturers of Petroleum Gas.
For sale, Parrish's Patent Gas and Air Mixer, adapted to all works using Petroleum or other oils, by which rich Petroleum Gas is mixed, after it leaves the holder, with a proper proportion of air, giving it the greatest illuminating power, without smoke, through any burners. The apparatus being attached to the outlet pipe, requires no alteration of the works.
Apply at the Gas-Works of St. Nicholas Hotel, No. 63 Mercer st., N. Y., where one can be seen in operation; or address D. Parrish, Jr., St. Nicholas Hotel, New York city, or No. 1416 Arch street, Philadelphia.

ANALYTICAL CHEMIST.
C. ELTON BUCK,
Analytical and Consulting
CHEMIST,
39 NASSAU STREET, NEW YORK,
Analyses of Ores, Minerals, Soils, Guanos, Coals, &c., and Tests of Commercial Articles, carefully and promptly made. Consultations may be had, and opinions given on Chemical questions. Samples for analysis from a distance, may be sent by mail or express, directed to the Laboratory as above.

AMERICAN
GAS-LIGHT JOURNAL.
A FEW COPIES OF
Vols. I. and II.
Substantially bound in cloth, may be had at the Office of this JOURNAL, No. 39 Nassau St., N. Y.

VAN KIRK & CO.

Manufacturers of

CHANDELIERS, GAS FIXTURES, &c.,

Bronze Figures & Ornaments, Porcelain & Mica Shades,

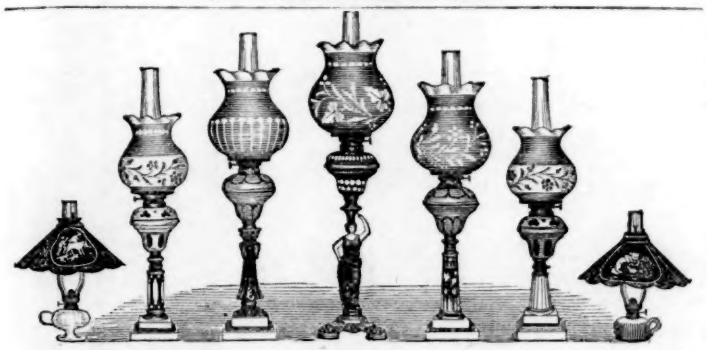
COAL OIL BURNERS,

HAND LAMPS, COLUMNS, &c.,

No. 517 ARCH STREET, PHILADELPHIA.

Factory at Frankford, Philadelphia.

ALL GOODS WARRANTED.



DIETZ & CO.,

Manufacturers, Exporters, and Dealers in

PETROLEUM OIL LAMPS,

And all Goods appertaining to the Lamp Trade,

132 WILLIAM STREET, NEW YORK,

AND

4 St. Paul's Buildings, London, England.

GAS-BURNERS.

F. LUNKENHEIMER'S

ADJUSTABLE

GAS-BURNER.

Patented Sep. 8th, 1863.

This burner will give a good steady light under irregular pressures, and can be regulated to any size of light, thus saving gas. It will not clog up, and prevents blowing.

Orders will be promptly filled by addressing the Patentee, at the Cincinnati Brass Works,

No. 13 East Seventh Street,

Cincinnati, Ohio.

F. LUNKENHEIMER.

T. G. ARNOLD,

MANUFACTURER OF

GAS-BURNERS,

And Importer of SCOTCH TIPS,

No. 447 BROOME ST.,

Second door west of Broadway, New York.

Mercury Cups, Portable Sockets, Burner Pillars, Burner Pliers, &c., &c.

ORNE'S PATENT FILTER REGULATING GAS-BURNER,

Admitted by all practical and scientific men who have examined its movements, to be

THE BEST GAS-BURNER YET INVENTED.

They are

Self-Regulating,
Gas-Purifying,
Indestructible, and
Most Economical.

For sale by—

S. A. STETSON & Co.,

350 WASHINGTON STREET,

Boston, Mass.

C. GEFRORER,

Manufacturer of

GAS-BURNERS,

For Lighting and Heating Purposes.

GAS HEATING AND COOKING APPARATUS; FITTERS' PROVING APPARATUS, &c.

No. 111 South Eighth St.,

Philadelphia.

A. CARR, MANUFACTURER AND DEALER IN WROUGHT AND GALVANIZED IRON PIPE, BRASS COCKS, VALVES, &c., and all descriptions of FITTINGS FOR STEAM, WATER and GAS,

135 MERCER STREET, New York.

WOODEN PURIFYING TRAYS.

PATENT

Conically Slotted Solid Wood Sieves

FOR GAS PURIFIERS.

CAUTION

TO

GAS MANUFACTURERS.

The Conically Slotted Solid Wood Tray was patented 21st October, 1862, by N. O. Hawxhurst, assignee of Wm. Combe, and all persons are cautioned against purchasing such trays of R. G. Hunt, or any other person except the subscriber, as it is a direct infringment of said patent. The following companies are now using these trays.

Manhattan, New York,
Williamsburgh,
Brooklyn,
Albany,
Baltimore,
Philadelphia,
Chicago.
Louisville,
And numerous others.

Orders received by mail or otherwise.

JOHN L. CHEESMAN,

147 Ave. C, New York City.

CLAY RETORTS.

ADDISON POTTER,

WILLINGTON QUAY,

NEAR NEWCASTLE-UPON-TYNE, ENGLAND,

Manufacturer of CLAY RETORTS, FIRE BRICKS, and every description of FIRE CLAY GOODS.

PHILADELPHIA FIRE-BRICK Works, corner of Vine and Twenty-third streets, Philadelphia.

JOHN NEWKUMET,

Manufacturer of all kinds of FIRE-BRICK, GAS-HOUSE TILES, to suit all the different plans in use. Clay Retorts and Dentists' Muffles. Orders filled at short notice.

PETROLEUM GAS.

THE AUBIN GAS-WORKS COMPANY, OF ALBANY, N. Y., have adapted their Works to petroleum and the heavy oil obtained from its distillation. Parties desiring information will be referred to Village Gas-Works thus adapted, where the ordinary yield of gas is from 150 to 200 cubic feet per gallon of oil. This yield, and the great improvements which experience has added to the Aubin Works, enable them to make a rich gas at a low cost—the only way to compete with kerosene.

IRON FOUNDRIES.

MORRIS, TASKER & CO.,

PASCAL IRON WORKS,

[ESTABLISHED 1821.]

PHILADELPHIA.

Manufacture Wrought Iron Welded Tubes for Gas, Steam or Water; Lap-Welded Boiler Flues, GALVANIZED WROUGHT IRON TUBES,

ARTESIAN WELL PIPES,

of Wrought or Cast-Iron, screwed together, flush inside and out; Gas-works Castings, Retorts and Bench Castings for Coal Gas-works,; Cast-Iron Street Mains, Bends, Branches, Drips, &c.

Gas and Steam Fitters' Tools, &c.

STEPHEN MORRIS,
THOMAS S. TASKER,
CHAS. WHEELER,
STEPHEN M. P. TASKER.

BERGEN IRON WORKS,

Established 1833.

R. A. BRICK, Manufacturer of CAST IRON WATER and GAS-PIPES. RETORTS, PIPES, &c., always on hand. Office, 109 Leonard Street, New York.

S. FULTON & CO., (Successors to Colwell & Co.) Manufacturers of Pig Iron and Cast Iron Gas and Water Pipes, also Heavy and Light Castings of every description, No. 207 North Water street and 206 North Wharves, Philadelphia.

SAMUEL FULTON, THEO. TREWENDT.

FLORENCE IRON WORKS.—The subscriber is prepared to execute orders and make contracts for Cast-Iron Water and Gas-Pipes, from 2 inches to 48 inches in diameter; also, Retorts, Bench-Castings, Branches, Bends, and all Castings for Water or Gas-Works. Pipes and Castings coated with Smith's Patent Coal Tar Varnish to prevent corrosion.

JOSEPH G. JONES,

205½ Walnut Street, Philadelphia.

THE ALPHA TUBE WORKS,

WALSALL, STAFFORDSHIRE, ENGLAND,

Established 1830.

LAMBERT BROTHERS,

Manufacturers of

LAP-WELDED BOILER TUBES, LOCOMOTIVE AND MARINE ENGINE FITTINGS,

Wrought Iron Welded Pipe,

FOR STEAM OR HIGH-PRESSURE WATER AND GAS; HIGH-PRESSURE STEAM AND WATER VALVES,

FIRE & GARDEN ENGINE WORK, PUMPS, HYDRANTS, WATER-CLOSETS,

Iron and Brass Gas-Fittings, Gaseliers, &c.

AND OF THE GROVE BEDSTEAD WORKS, WALSALL.

Delivery Free, in Liverpool, &c.

Catalogues post free.

POOLE & HUNT, BALTIMORE, MD., are prepared to execute orders for

GAS-HOLDERS,

IRON-ROOF FRAMING,

And all other descriptions of

Iron Work for Gas-Works, Water-Pipes, and Heavy Castings, and Machinery generally.

R. D. WOOD & CO.,

MANUFACTURERS OF

CAST-IRON PIPE, RETORTS, &c.

Office, 400 Chestnut Street,

PHILADELPHIA.

J. VAUGHAN MERRICK, W. H. MERRICK,
JOHN E. CORE.

SOUTHWARK FOUNDRY,

FIFTH & WASHINGTON STREETS,

PHILADELPHIA.

MERRICK & SONS, Engineers.

MANUFACTURERS OF EVERY DESCRIPTION OF GAS MACHINERY.

Retorts, Bench Castings, Condensers, Washers, Scrubbers, Wet or Dry Lime Purifiers, Coke Wagons, Fire Tools, Wrought Iron Grate Bars, Gasholders, either Telescopic or Single, with Suspension Frames complete; Wrought Iron Roof Frames, for Iron or Slate; Stop Cocks, Exhausters, Steam Pumps, Boilers and Tanks, Steam or Hand Air Pumps for providing Street Mains, Centre Seals, Governors, Wrought or Cast-Iron Line Sieves for Purifiers, Purifier Hoisting Machines, &c., &c.

Address— MERRICK & SONS,

5th and Washington Streets, Philadelphia.

THE GROVER & BAKER SEWING MACHINE, everywhere triumphant. This Machine has taken the First Premium at the State Fairs last held in

New York,	Missouri,
New Jersey,	Kentucky,
Ohio,	Tennessee,
Indiana,	Virginia,
Illinois,	North Carolina,
Michigan,	Alabama,
Iowa,	California,

Including every State Fair at which it has been exhibited in 1862.

The Work made on the Grover & Baker Machine has taken the First Premium at every Fair in the United States where it has been exhibited to this date. GROVER & BAKER S. M. CO.,

495 Broadway, N. Y.

OUR AGENTS.

AGENTS OF

The American Gas-Light Journal,

From whom it can be purchased in single copies or by the year.

TERMS—$3 per annum. Single copies 15 cents. Liberal discount to Dealers.

ALBANY, N. Y.	Thomas Hastings, P. L. Gilbert, Wm. J. Bell.
BOSTON, Mass.	D. Howard, Jr., Cushing & Bowen.
BRIDGEPORT, Ct.	News Agent at R. R Station.
BUFFALO, N. Y.	T. G. Hawks, B. F. Felton, D. Lockwood.
CARMANSVILLE, N. Y.	W. Cameron.
CATTSKILL, N. Y.	W. Van Loan.
CHICAGO, Ill.	J. McNally, J. R. Walsh, Shear & Co.
CLEVELAND, O.	Hawks & Bros.
COLDSPRING, N. Y.	A. Tenant.
DOBBS' FERRY, N. Y.	E. Ackerman.
ELIZABETH, N. J.	R. Caldwell, Wm. Gale.
ELMIRA, N. Y.	M. B. Brink.
FALL RIVER, Mass.	L. J. Moroo.
FISHKILL LANDING, N. Y.	J. R. Van Slyke.
FISHKILL VILLAGE, N. Y.	B. Stanbach.
FORT WASHINGTON, N. Y.	J. Maloney.
FRANKLIN, N. Y.	G. W. Reynolds.
GALENA, Ill.	G. H. Schenck.
HARTFORD, Ct.	D. C. Pond, C. J. Geer.
HASTINGS, N. Y.	D. Crane.
HONESDALE, Pa.	A. G. Forbes.
HUDSON, N. Y.	G. Parton.
HYDE PARK, N. Y.	J. N. De Graff.
JAMESTOWN, N. Y.	G. W. Hazletine.
KINGSTON, N. Y.	C. Van Buren.
MILBURN, N. J.	W. Hastings.
MORRISTOWN, N. J.	J. West, J. R. Runyon.
NEWARK, N. J.	Agens & Co., J. R. Jillison.
NEWBURG, N. Y.	W. H. Callahan, J. M. Martin, P. C. Daly, G. P. Lomas.
NEW HAVEN, Ct.	E. Downs, T. H. Pease.
NEWPORT, R. I.	B. J. Tilley.
NEWTOWN, N. J.	H. Warren.
NYACK, N. Y.	H. Hazelbarth.
PEEKSKILL, N. Y.	J. A. Green.
PHILADELPHIA, Pa.	V. H. Myers, 152 South Fourth street.
PITTSBURG, Pa.	J. W. Fittock, Henry Miner, L. P. Hunt.
POUGHKEEPSIE, N. Y.	J. H. Bush, W. Patrick, G. Williamson.
PROVIDENCE, R. I.	D. Kimball,
RAHWAY, N. J.	W. H. Neefers.
RONDOUT, N. Y.	A. M. Barbes, Winter Bros.
SARATOGA SPRINGS, N. Y.	A. Hill.
SAUGERTIES, N. Y.	T. J. Barrett.
SING SING, N. Y.	F. Bushers.
SOMMERVILLE, N. J.	C. Barkalow.
STAMFORD, Ct.	G. R. Treate. News Agent at R. R. Station.
ST. JOHNSVILLE, N. Y.	G. A. Russell.
SYRACUSE, N. Y.	J. H. Green.
TARRYTOWN, N. Y.	C. De Riviere.
TOLEDO, O	L. C. Shear.
TROY, N. Y.	L. Willard, J. F. Hoyt.
WASHINGTON, D. C.	Frank Taylor, P. De Vine, Kirkwood House, News Agent Willard's Hotel.
WATERBURY, Ct.	D. J. Bishop.
WELLSVILLE, N. Y.	Wm. Patton.
WEST POINT, N. Y.	H. N. Sheerar, R. A. Grand, opposite West Point.
YONKERS, N. Y.	D. Burns, John Featherstone.

General Agents in New York City.

ROSS & TOUSEY, 121 Nassau Street.

H. DEXTER & CO., 113 Nassau Street.

OKIE, DAYTON & JONES, cor. Ann and Nassau Sts.

L. N. SHEAR & CO., 55 Hudson Street.

HAMILTON, JOHNSON & FARRELLY, 22 Ann Street.

J. F. FEEKS & CO., 24 Ann Street.

F. S. THOMSON, New Haven Railroad Station 27th Street.

THOMAS FITZGIBBONS, New Jersey and Amboy Railroads.

ALEXANDER CRAW, Harlem Railroad Station, 26th Street.

WM. SKELLY, Greenwich Street, Erie Railroad Station, Duane Street.

In Canada.

THE AMERICAN GAS-LIGHT JOURNAL can be ordered through any of the News Agents in either of the Canadas.

In Great Britain.

Terms 12s. per annum, single copies 10d.

TRUBNER & CO., 60 Paternoster Row, London.

In France.

Terms 15 Frs. per annum.

Bureau of *Le Journal de l'Eclairage au Gas*, Boulevard de Poissonniere, No. 24, Paris.

ROOMS IN NEW YORK.—No. 39 Nassau Street, opposite the Post Office.

Terms—$3 per annum. Single copies 15 cents.

THE AMERICAN METER CO.,

Organized under the General Manufacturing Laws of the State of New York.

SAMUEL DOWN, President. HENRY CARTWRIGHT, Vice President. RICHARD MERRIFIELD, Secretary and Treasurer.

Trustees.

SAMUEL DOWN, WILLIAM HOPPER, R. H. GRATZ, HENRY CARTWRIGHT, RICHARD MERRIFIELD, THOMAS C. HOPPER, *Superintendent at Philadelphia.*

This Company is now prepared to furnish WET AND DRY GAS METERS, STATION METERS, GOVERNORS, PRESSURE INDICATORS and REGISTERS, SERVICE and METER COCKS, and all other articles in their line appertaining to the use of Gas-Works.

The combination of Mechanical and Scientific Skill, and the long experience of the several members of the Company, is a sure guarantee of durability, accuracy, and excellence of workmanship. Orders addressed

AMERICAN METER COMPANY,

340 WEST TWENTY-SECOND STREET, NEW YORK,
1504 FILBERT STREET, PHILADELPHIA,
1 BARRETT STREET, BOSTON, will meet with prompt attention.

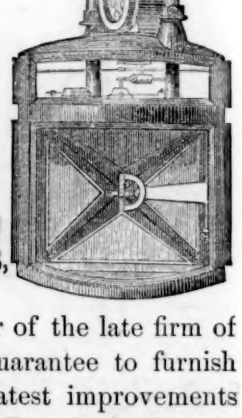
HARRIS & CO.,

(LATE HARRIS & BRO.,)

N. W. CORNER 13TH & CHERRY STREETS,

PHILADELPHIA,

MANUFACTURERS OF



WET AND DRY GAS-METERS,

METER PROVERS, CENTRE SEALS, PHOTOMETERS, GOVERNORS, STATION METERS, EXPERIMENTAL METERS, PRESSURE REGISTERS, PRESSURE GAUGES, &c., &c.

The firm of Harris & Co., which comprises the senior partner and only practical Meter maker of the late firm of Harris & Bro., will continue the manufacture of Meters, &c., of every description, and will guarantee to furnish an article of Meters equal to the best in the country, at the lowest rates, and combining the latest improvements with great durability and accuracy. The reputation of the Meters of the late firm of Harris & Bro. is confidently appealed to. All our Meters are tested by a sworn Inspector. Terms Easy.

HARRIS & BROTHER,

PRACTICAL GAS METER MANUFACTURERS,

Continue, as heretofore, at their old Establishment,

No. 1117 CHERRY ST., PHILADELPHIA,

TO MANUFACTURE

WET AND DRY GAS METERS (Consumers'),
STATION, EXPERIMENTAL AND SHOW METERS,
GLAZED METERS, METER PROVERS, AND PHOTOMETERS,
GOVERNOR AND CENTRE SEAL DRUMS,
FLUID AND PRESSURE GUAGES,
PRESSURE REGISTERS AND INDICATORS, &c., &c., &c.

All our work warranted. All orders addressed to

HARRIS & BRO., 1117 Cherry Street, Philadelphia.

PRINCE'S METALLIC PAINT,

AN INDESTRUCTIBLE COATING FOR

IRON, TIN, and WOOD.

It consists of seventy-two parts Oxide of Iron, and twenty-eight parts Cement Lime Stone in the one hundred pounds.

It has much more body than red or white lead. It is warranted perfectly water and fire-proof and to withstand a greater heat on metals, without scaling, than any other paint in use.

It is a perfect cover for all kinds of iron, tin, or wood-work, out-houses, and canvas coverings. It prevents and arrests the corrosion of metals, and is not affected by the action of salt, gases, acids or ammonia.

It hardens under water, as has been fully demonstrated by its application to gas-holders, by many of the largest gas companies in the United States; which companies having thoroughly tested its properties as herein claimed, pronounce in its favor over any other paints in the market, even though sold at double its price.

As a coating for patterns of iron or wood, when mixed with shellac, it is much superior to beeswax, oil, or shellac alone, as has been proven at the large founderies in the country.

For patching boilers and making joints, it is considered superior to red lead, or any other preparation.

For cleaning metals it takes the place of crocus, rouge, and emery, being better and cheaper.

This Paint requires no more oil than dry lead or zinc, and much less than the ordinary mineral paints. It is free from any waste, and possesses a spreading and covering power unequaled.

Terms, by the Barrel or Half Barrel, Four Cents per Pound.

A liberal discount made to parties purchasing by the ton.

A Barrel or Ton will be forwarded to any gas companies desirous of testing its qualities, for which there will be no charge if it does not give entire satisfaction as being the cheapest and most durable of all other Paints in the market.

Also, Prince's Imperial Black Paint, and Prince's Protoxide of Iron.

DANIEL SLOAN, General Agent,
115 Liberty Street, New York.

Local Agents—S. R. Williams, 204 South Front st., Philadelphia.
Calvin Gay, 29 Doane st., Boston.

PROTECTED WROUGHT-IRON WATER & GAS PIPE,

HYDRAULIC CEMENT SEWER PIPE,

KNIGHT, WOODWARD & CRAWFORD,

Office, Cor. Reade & Centre Sts., New York.

Sewer Pipes extensively used in Brooklyn, and now introduced in New York, Jersey City, Newark, Hartford, Albany, and other localities, from 3 to 24 inches in calibre.

Water Pipes, lined and coated with Cement mortar, ready for laying and back filling, and can be tapped like cast-iron pipes, which they excel in durability, discharge, and economy.

Factories { Cor. Bond & Union sts., Brooklyn. " Washington & South 8th sts., Jersey City.

NEW YORK FIRE-BRICK Manufactory. (Branch Works at Kreischerville, Staten Island.)

B. KREISCHER & CO., office 56 Goerck street, corner Delancy street, New York.

Gas-House Tiles and Fire-Brick of all shapes and sizes. Fire Mortar, Clay, and Sand articles of every description made to order at the shortest notice. B. Kreischer. M. Maurer, A. Weber.

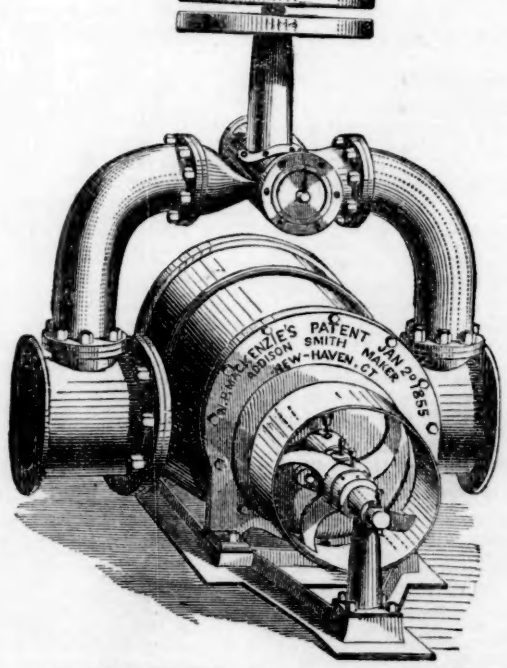
THE AMERICAN

PETROLEUM COMPANY,

OF THE CITY OF NEW YORK,

No. 10 Pine Street.

W. W. CLARKE,
Vice-President.



SMITH & SAYRE,

Sole Proprietors and Manufacturers of

THE MACKENZIE PATENT GAS EXHAUSTER

AND

PATENT COMPENSATOR.

They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-joints, is compact, durable, cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

We are also sole proprietors and manufacturers of the

MACKENZIE PATENT BLOWER, PATENT CUPOLA AND SMELTING FURNACE.

The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary Fan. The Cupolas are manufactured in sizes to melt from 1 ton to 20 tons per hour, will save one quarter of the time required by the old style Cupola, and 33 per cent. fuel Address SMITH & SAYRE. 458 Broadway, New York.

NEWSPAPER WRAPPERS. Mara's Patent Self Sealing and Folding Water-lined Newspaper Wrappers, $1.50 per 1000. Sold by

HAMILTON, JOHNSON & FARELLY,
22 Ann st., New York.

CLARK'S PATENT STEAM AND Fire Regulator Co., sole Patentees and manufacturers of Clark's Patent Steam and Fire Regulator, No. 5 Park Place, New York.

W. H. Perrine, Pres.